TELEPHONE ENGINEER

MANAGEMENT • ENGINEERING • MAINTENANCE

SEPTEMBER 1936

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Chicago
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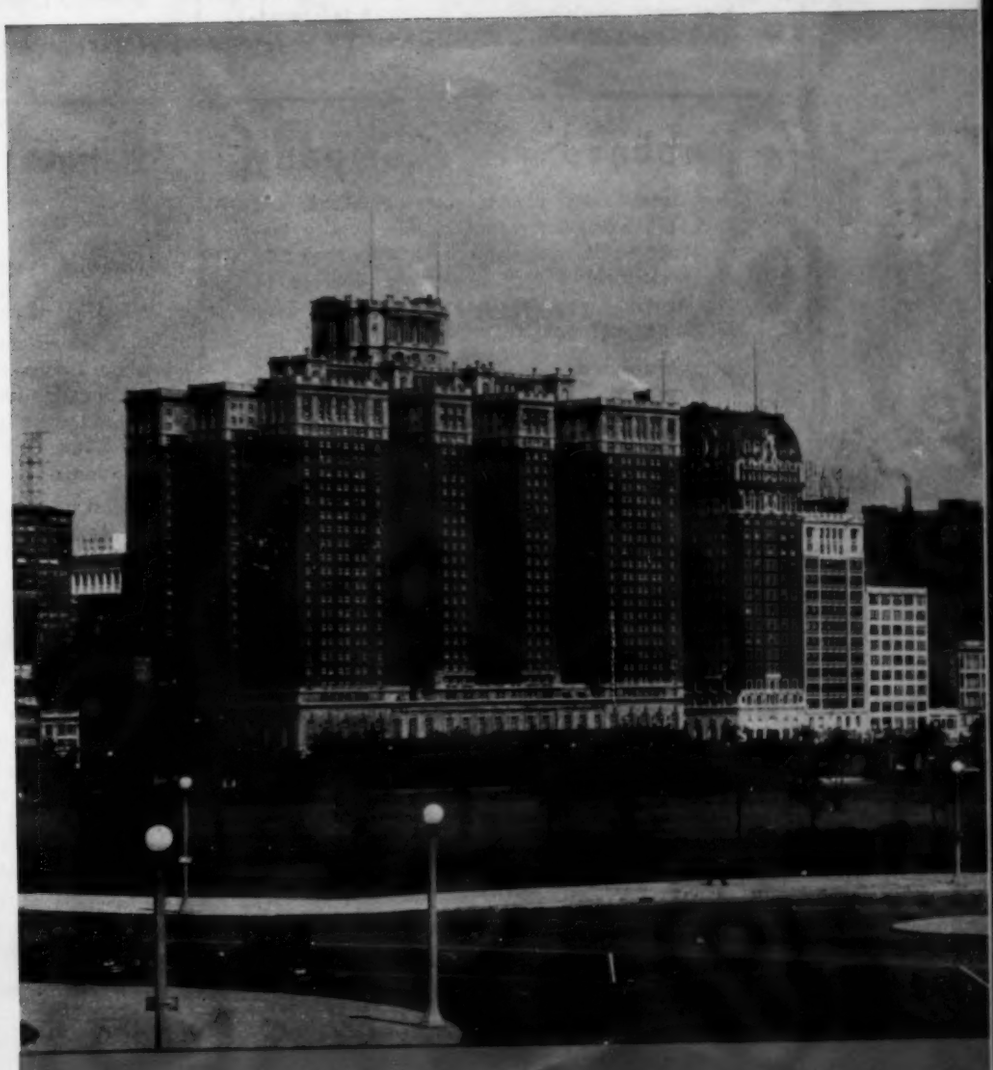

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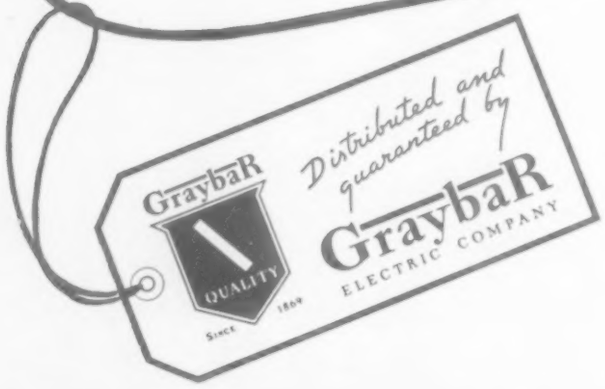

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TELEPHONE ENGINEER
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SEPTEMBER, 1936

"Tapping In" On Washington

By ROLAND C. DAVIES
Editor
Telecommunications Reports

● The Federal Communications Commission moved with swift action during the latter part of August and early September to accomplish two developments of outstanding interest to the telephone industry. One move, which is of importance to the American Telephone and Telegraph Co. and Bell System, was the shifting of the program of the telephone investiation from the previous probing of all phases of the industry into a specific inquiry on telephone toll rates with the aim of accomplishing a reduction. The other development, which holds considerable significance to the Independent industry, was the progress made by the FCC in the classification of a large number of Independent companies as connecting carriers, not subject to the commissions's full jurisdiction.

The change in the objectives of the telephone investigation to concentrate upon the reduction of long distance telephone rates came September 10 with the issuance of an order by the FCC, calling upon the A. T. & T. to defend its rates, services, classifications, practices and regulations to justify indicated excessive toll operations profits and complaints that the past voluntary reductions had been insufficient. The new investigation climaxed a month of rather startling developments at the commission in the investigation.

● As has been well known for some time, there had been a distinct division of views among the commissioners about the results and conduct of last Spring's hearings in the investigation. One major phase of criticism was the ex-parte method of procedure at those hearings, conducted by Acting Special Samuel Becker, under which the A. T. & T. witnesses were on numerous occasions forced to answer categorically to the FCC counsel's interrogations without giving any explanations and commission witnesses were permitted to put in evidence on many phases of the telephone industry with broad accusation, which no cross-examination on their charges was permitted the A. T. & T. counsel. Another factor of friction in the commission lay in the fact that the subject matter of the hearings during the Spring had been, to a large extent, non-essential in connection with the major issue of the investigation —telephone rates and the rate structure —and that much of the proceedings had been carried seemingly with the idea of securing good press publicity or "headline hunting". Leading commissioners had also felt that a serious error had been made in the failure to present any testimony by the investigation engineers under Chief Engineer Cyrus G. Hill on the "meatier" subjects of manufacturing costs, engineering practices and depreciation.

This situation culminated in a proposal in mid-August by Vice Chairman Thad H. Brown of the telephone division that the investigation concentrate upon a probe of the interstate communication rates and practices of the A. T. & T.—the specific province of the FCC regulatory jurisdiction. The new rate investigation, the commission also decided, should be handled by a new special associate counsel, Carl I. Wheat of Los Angeles, Cal., who had just successfully concluded a $1,250,000 rate reduction by the Southern California Telephone Co. and had had seven years of utility rate regulation experience with the California Railroad Commission as well as the past three years as utilities counsel of Los Angeles. A shakeup of the investigation staff also had been rumored with the possible resignation of Chief Accountant John H. Bickley.

● The investigation now will be conducted along two fronts. Under the direction of Becker, who will continue as associate counsel with Wheat, the remaining phases of the general inquiry into the industry will form the subject matter of further hearings and it is expected that these proceedings will delve into the Bell System's non-telephonic services, patents, additional data on legislative and propaganda activities and pensions. According to Telephone Division Chair-

man Paul A. Walker, the resumption of hearings on the general phases of the investigation will come first and the rate investigation sessions will be launched later in the Fall.

• ● •

Centered Against A. T. & T. . . .

The rate investigation will be centered solely upon the American Telephone and Telegraph Co. and will not be directed at the other Bell System companies. The division order, calling upon the A. T. & T. to show cause why toll rates should not be reduced, stressed that the action was based on complaints received by the commission and that the public was highly interested in a reduction of long distance charges Citing the allegations of excessive profits brought out in last Spring's investigation hearings, the order noted that this situation warranted probing and emphasized that the complaints of the public showed a view of past reductions being insufficient.

● Chairman Walker characterized the recent A. T. & T. rate reduction, estimated to save the public $7,350,000, which went into effect Sept. 1 as "a drop in the bucket" of what toll charges should be. He cited that this reduction affected only a small percentage of the toll calls because of the 234-mile limitation and did not benefit the average intrastate toll rate situation. Among major complaints which had come to the commission by word of mouth or by letter, Chairman Walker said that one source of friction had been on the overtime charges for person-to-person calls being higher than station-to-station calls and that there had been claims of overcharges in the timing of their toll conversations. Besides toll rates, another subject of the inquiry will be upon charges for broadcasting program transmissions and the commission has already asked the 635 broadcasting stations of the country to transmit to it their complaints about the telephone service and rates on this program relaying.

A change in the conducting of the hearings will take place with the rate investigation, Chairman Walker stated. The A. T. & T. will be given full opportunity to present testimony in the rate proceeding and he said that it was "entitled to be heard in any inquiry of this type". This will be a different situation from the general source of the previous general hearings under Becker when the A. T. & T. was permitted but little opportunity for testimony to counter the charges of the FCC investigation witnesses. Chairman Walker also indicated that individual subscribers would be allowed to give testimony on their complaints, while organizations would be permitted to intervene and to present testimony on their situation. One group already has indicated that it would present an extensive complaint against rates — American Hotel Association. Commissioner Walker does not expect any extensive valuation will be needed to secure the ordering of a rate reduction but did indicate that spot check valuations might be in order.

• ● •

Congressional Probe . . .

By the move of plunging into a toll rate investigation, the commission hopes to stave off any threats of a probe by Congress of the results and methods of the telephone investigation up to the present. There has been a good deal of critical attention given to the progress of the investigation, not only by President Roosevelt but also by leading members of Congress—the bad public reaction aroused by the ex-parte method of procedure in the previous hearings and the fact that the FCC is spending $1,150,000 in the investigation have created considerable interest among the administration leaders. Members of Congress also have expressed views about the scope of the investigation being too broad and as one leading representative said the inquiry's authorizing resolution might even mean the character of the telephone operators should be inquired into.

● The toll rate investigation, however, will strike a popular chord, it is believed, not only with members of Congress but also with the general public. If its results prove successful, it is deemed quite likely that Congress would appropriate an additional allotment to carry on the investigation beyond next February, when the $1,150,000 fund will become exhausted. At the last session of Congress, House appropriations committee leaders indicated rather definitely that no more funds would be likely to be forthcoming for the continuance of the general type of investigation carried on last Spring.

With the concentration of the investigation fire on the A. T. & T., the Independent telephone industry will be completely withdrawn from the probe, it is felt. In the previous hearings Chief Accountant Bickley had charged in several instances that the Independent industry was closely allied with the Bell System, especially in its state independent telephone associations. Bickley also had stressed that no Independent manufacturing company was free from the domination of Western Electric, failing to mention any of the exclusive telephone inventions of the Independent industry. He alleged that all but a few of the Independents were linked with the Bell System, basing his charge upon the fact that only a few telephone companies were not connected with the nation's long distance telephone system. Before the investigation is concluded, it is likely that the Independent industry may be given an opportunity to refute these charges.

• ● •

Jurisdiction Over Independents . . .

● Notable progress in the classification of the Independent telephone companies in relation to the FCC's jurisdiction was made during the past few weeks by the commission and the results of these steps appeared to be highly satisfactory to the Independent industry. With practical decisions, the commission has indicated a definite trend not to impose its jurisdiction over small Independents, except where the law leaves no other recourse. The commission will not harass or overburden the small Independents, according to Chairman Walker, but any Independent under FCC regulation can easily be classified so as to avoid any more supervision than is absolutely mandatory.

Several new policies were evolved in the classification of Independents First, Independent companies which had lines touching over state boundaries, were placed in the category of connecting carriers—there were two such companies, the Standard Telephone Co. of Alabama and the Harrison (O.) Telephone Company. Second, Independent companies which had previously operated interstate lines but since the FCC's creation had disposed of them, were classified as connecting carriers. The Sullivan (Ind.) Telephone Co. was granted this classification following its sale of 1½ miles of line in Illinois to the Illinois Commercial Telephone Co. in the Fall of 1935. For a time there had been a view at the FCC that sale of lines to avoid federal jurisdiction constituted grounds for a probe of such action but this position, it can be interpreted from the recent Sullivan decision, was overruled and it is expected that similar findings will be rendered in connection with other companies engaging in such transactions.

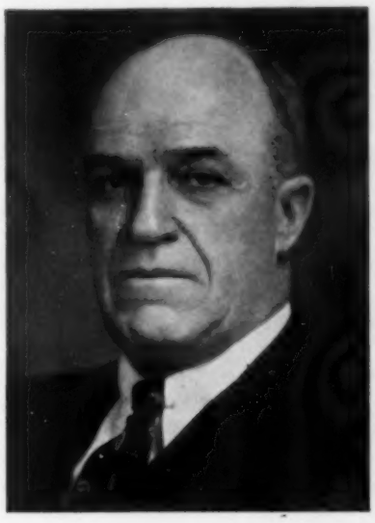
● Another major step was the ruling by the telephone division that the furnishing of wires to broadcasting stations for program transmission was not interstate commerce and such serice was merely an act of a phyically connecting carrier. This lifted the threat of FCC jurisdiction from approximately 30 Independent companies of Class A and B size. As a result several companies have already been notified that they are classed as Section 2-B-2 connecting carriers, in-

(Please turn to page 48)

Plan Biggest Convention In Years

F. B. MAC KINNON, President

Personal contacts, renewal of acquaintances investigations of equipment and discussions of operating methods most valuable assets of convention of United States Independent Telephone Association.



C. C. DEERING, Secretary-Treasurer

● Telephone men who fail to attend the fortieth annual convention of the United States Independent Telephone Association will be passing up one of the best and most potent opportunities to become acquainted with the trends in the industry than they have had in many years. The convention will be held October 13, 14, 15, 16 at the Stevens Hotel, Chicago.

Present calculations indicate that this year's convention will have the best program, the greatest attendance and the most complete display of telephone equipment than any convention held during the past several years.

It shoulddn't be necessary to urge any telephone man or woman to attend the convention. Annual conventions have always been important events of the year for progressive telephone men and women and this year's meeting will be no exception. Attendances and equipment displays the last few years have been at a minimum because of the necessity of cutting down expenses but now that "things look a little brighter" telephone companies everywhere are planning to send representatives to this all-important national meeting.

● The first convention of the Independent telephone industry was held in Detroit in 1879.

The group that held the Detroit meeting were pioneers—few of them are left to tell the story of the competitive battle of that year. The operating companies were few and they were fighting for place against the Bell forces that were determined to hold the telephone field for themselves. The Independent manufacturers were being established after the expiration of the basic patents that had enabled the Bell companies to prevent the manufacture of telephone equipment except under their license.

The passing years have seen a great change — large Independent operating companies have been developed — Independent manufacturers are able to deliver the finest of telephone equipment from well manned and financed factories. Over 6000 separate Independent companies supply the public with telephone service in 14,000 communities. There is interconnection between all of these exchanges and the 6000 Bell exchanges by means of Independent and Bell toll lines. There is universal service but under more than 6000 ownerships.

● The Independent companies have been united by their state and national associations. Every year the National Association has called the companies together in a convention to enable the widely separated managers to contact each other, discuss mutual problems, investigate the latest improvements in equipment and obtain courage and inspiration for continuing to offer their subscribers the best telephone service in the world.

The change from competitive to cooperative effort is perhaps the most important difference between the first and the fortieth conventions. With the elimination of competition came government regulations—state and national. Among the questions always discussed at national conventions are regulatory procedures and results. At the coming convention this discussion will involve the overlapping of state and federal authorities and the problem of a definite dividing line between them.

No telephone company is free from the effects of present economic conditions. There is no manager of a telephone company that does not wonder about the business future of the nation. In recent years at the national conventions a prominent place on the program has been given to a discussion of this question by an outstanding economist. At the coming convention several economists will give their opinions.

In his notice to member companies of the convention and the program, Secretary C. C. Deering states special conferences have been arranged for the accountants, plant superintendents and engineers, traffic people and the men of the business end — the executives and commercial superintendents. This provides something for every man in every department and should make the convention attractive to all. Such division meetings were conducted several years ago when the convention was held in the large exhibit hall on the ground floor of the Stevens Hotel. They were well at-

tended and approved by the various groups. If these groups are still in favor of such meetings they can best say so by attending the division conferences scheduled for this year's convention.

● No telephone convention is complete without the exhibits of manufacturers. New equipment has a great fascination for every operating man. Now that several years have passed during which many companies bought little, if any, equipment, there is a real demand for instruments and line supplies. The problem is "what kind to buy". About fifty different dealers in supplies and manufacturers of equipment have reserved rooms on the twenty-fifth floor of the Stevens Hotel. Here their representatives will be on hand to greet their old customers and meet prospective ones. Aside from the program, the convention is of real value to every operating man for the opportunity it presents for him to see the latest equipment and discuss it with men who know.

After all, the convention is the yearly opportunity to get in touch with "the other fellow" who is endeavoring to do his part in furnishing the best in telephone service. These personal contacts, renewal of acquantances, investigations of equipment, and discussions of operating methods with these other fellows are the most valuable assets of a convention.

Pioneers Plan Banquet; Gala Entertainment

Plans to make the annual entertainment of the Independent Pioneer Telephone Association on Thursday evening, October 15, during the annual convention of the United States Inpendent Telephone Association at the Stevens Hotel, Chicago, the best ever are progressing rapidly.

According to George W. Rodormer, chairman of the entertainment committee, enthusiasm over the Pioneers' party is at high ebb. Reservations for the banquet and entertainment are already being made and present indications point to a "full house" for the evening.

This year, there will be a departure from the previous programs in that the annual banquet and entertainment will be held at night instead of at noon.

In years gone by an ordinary luncheon has been held at noon, followed by entertainment, but this year the Pioneers will present "An Evening at a Night Club" with all the "frills and thrills" included in the best of Chicago's night club programs.

The night's activities will begin with a banquet at 7 p.m. during which music and entertainment will be offered. After the last course is served, the first section of the floor show will be presented. This will be followed by an intermission of about an hour for dancing in the floor-show space. The second section of the floor show will be presented at about 10:30 or 11 o'clock with general dancing the remainder of the evening.

Some of the best performers, who have appeared at popular night clubs in various large cities of the country have been engaged so that the floor show will greatly excel entertainment presented at the average night club.

In keeping with night club procedure, arrangements are being made so that table reservations may be secured by Pioneers and their friends by mail in advance of their arrival in Chicago for the national convention. Tickets for the "Evening at a Night Club" are priced at $3.00 per person and reservations may be made by writing to John F. Jaap, Cook Electric Co., 2700 Southport Ave., Chicago. Tables will be assigned as rapidly as reservations are received—"first come, first served." This covers the banquet, floor show and dancing. Reservations should be made immediately in order assure attendance at this unprecendented entertainment—and at a cost far below that charged by popular night clubs.

Tables seat eight persons each and it is recommended that Pioneers and their friends planning to attend the telephone convention together send in group reservations for the banquet and entertainment.

The personnel of the entertainment committee which is planning this gala affair include: George W. Rodormer, Reliable Electric Co., Chicago, chairman; John F. Jaap, Cook Electric Co., Chicago, secretary; Roy W. Siemund, American Automatic Electric Sales Co., Chicago; H. T. McCaig, Stromberg-Carlson Telephone Mfg. Co., Chicago; Frank L. Eldridge, Chicago, and M. A. Bellion, Kellogg Switchboard & Supply Co., Chicago.

The annual meeting of the Independent Pioneers will be held on Thursday, October 15. At this meeting the reports of the officers and committees will be received and the officers and directors will be elected for the ensuing year. Chas. A. Rolfe of Beverly Hills, California, is president of the organization and J. K. Johnston, Lemcke Building, Indianapolis, Indiana, is secretary-treasurer.

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Telephone Transmission
Theory and Practice

By ROBERT A. CLARK, JR.

CHAPTER VIII

Telegraph equipment associated with long distance telephone circuits is discussed in this chapter. Features of the differential duplex and quadruplex circuits are compared.

In the preceding seven chapters we have discussed the electrical principles involved in transmitting the voice signals between two points over a pair of wires. Brief mention has been made from time to time of telegraphy in connection therewith. Inasmuch as practically all long distance telephone lines carry both telephone and telegraph circuits we will discuss in this chapter the basic details of present day telegraphy with special regard to those features which have to do with, and effect telephone transmission.

As you undoubtedly know, it is possible to obtain either one or two d-c telegraph circuits in addition to a telephone circuit over one pair of wires. When one telegraph channel is superimposed on a mentallic telephone circuit the circuit is said to be **simplexed.** When two telegraph circuits are superimposed on the telephone circuit the circuit is said to be **composited.** The method of obtaining these facilities will be described in the next chapter.

D-c telegraphy as applied to open wire telephone lines is operated over one wire or its equivalent with the ground forming the return path. Where the telephone circuits are operated entirely through long cables, the telegraph circuit is operated metallic in the same way as the telephone; however, this being a limited application we will not discuss it in detail.

The earliest type of telegraphy originally developed by Morse and which is used extensively at the present time is known as the single line Morse circuit. Undoubtedly you are all familiar with this type of equipment and its operation. Fig. 39 shows a typical circuit except that generally there are a number of intermediate stations instead of one as shown. At the circuit terminals we have a battery and associated resistance for adjusting the current to the proper value, a key, line relay, sounder and its associated battery. At each intermediate station there is a key, line relay, sounder and associated battery. Normally all keys are closed and current flows in the line, maintaining the line relays in the operated position which in turn hold all sounder in the down or marking position. Signals may be transmitted from any one station to all the others by opening and closing the key at that station. If the receiving station desires to stop the sender the receiving key is opened and therefore, when the sender closes his key the sounder remains up thus indicating a "break." This is the basic principle on which single line Morse telegraph circuits operate. The same principle of operation has been carried over to the printing telegraph where each station has only one machine and transmission takes place in one direction only at a time.

It might be well to discuss at this point, the nature of the current flow during the transmission period. We may think of the current flow in the line when the sending key is opened and closed, as in sending a series of dots, as a combined d-c and a-c current the two components being of such magnitude, that the peak of the alternating current is equal to the d-c component. Then, when the key is open and no line current flows we have the effect of the negative half of the a-c component neutralizing the positive d-c flow. I mention this, because we will find later on that telegraph signals especially at the higher speeds as in printer operation act like alternating current and we study them by means

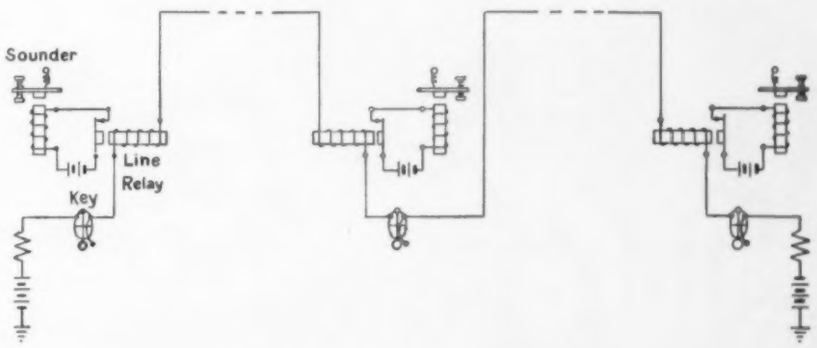

Fig. 39—Diagram of single line Morse circuit.

of alternating current theory. We also use alternating current terms in describing the telegraph signals. For example, when a series of dots are sent over a wire, the shape of the resultant current flow appears quite similar to the curve shown in Fig. 12, Chapter II. We can, therefore, define the periodic fluctuation in terms of its magnitude and number of pulsations or frequency. The faster the dots are sent, obviously the higher the frequency will be. Therefore, the greater the speed of sending a message, the greater will be the frequency of the pulsating current on the line. The frequency encountered in hand sending telegraph circuits is about 10 cycles per second. The single channel start-stop type printer operating at 60 words a minute (the speed commonly employed) produces a line frequency of 20 cycles per second. A two channel multiplex printer operating at 60 words per minute has a line speed of 30 cycles per second. In order to obtain a wave similar in characteristics to that in Fig. 12, you will recall that a third harmonic must be present. In can be demonstrated that in order to transmit reasonably undistorted telegraph signals, the circuit must be capable of transmitting the third harmonic as well as the fundamental. In other words, a circuit to successfully transmit a two channel printer operating at 60 words per minute must transmit the third harmonic of 30 cycles or 90 cycles. The frequency requirements for hand Morse operating at normal speed of about 10 cycles would be about 30 cycles. Practically any line will carry this frequency without difficulty.

Returning to the circuit shown in Fig. 39, let us consider briefly the details of equipment used therewith. If battery is supplied at but one end, this type of circuit is practicable up to about 100 miles. If battery is supplied at both ends, as shown in the diagram, satisfactory operation may be had up to about 200 miles. This is on the basis of using a 160v battery with a 300-ohm protective resistance in series with it. The line resistance and number of relays must be such that the line current under normal operation is not less than approximately 40 ma. The line insulation under wet weather conditions is the determining factor for satisfactory operation. Under conditions of low insulation the current through the receiving sounder will not drop to zero when the distant key is open due to leakage paths to ground. A typical case of current values under dry and wet weather conditions is shown in Table 11.

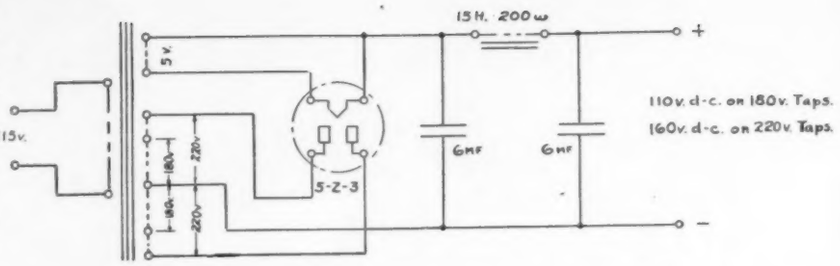

Fig. 40—Power supply unit for telegraph sets.

TABLE 11

Typical Current Readings for a Single Line Telegraph Circuit

	Current Through Home Station Relay	
	High Insulation	Low Insulation
Distant Key Closed	45 ma.	52 ma.
Distant Key Open	0	29
Margin	45 ma.	23 ma.

You will note that the current margin between dry and wet weather operation drops from 45 ma. to 23 ma. The line relay commonly used in telegraph circuits has two adjustments, one controlling the spring tension on the armature, the other, the air gap between the armature and electro-magnet. By proper adjustment of the spring tension and air gap, satisfactory signals will be received with conditions such as shown in Table 11. In general it is necessary to either increase the air gap or the spring tension or both at the receiving station as the line insulation decreases.

The sounders generally have four ohms resistance when used at way stations having a limited voltage supply such as gravity battery. The four-ohm sounder requires approximately 250 ma. for good operation. At stations where high voltage (110v) is available the sounders are wound for 400 ohms and require from 35 to 50 ma. for satisfactory operation. In general the higher current should be used especially in noisy offices as it gives a more solid signal than the lower current. 110v supply is generally used with approximately 3,000 ohms in series with each sounder. Main line type sounders are occasionally used on short lines. They generally have resistance of about 120 ohms. An adjustable air gap is provided to partially compensate for current variation such as occasioned by changes in insulation resistance. Such sounders are somewhat limited in operation and are suitable only on short lines having but few stations. A current of about 40 ma. is required for satisfactory operation.

The battery source for single line Morse circuits and also other types of d-c telegraph is generally 160v. Motor generator sets are generally employed in larger offices sometimes protected

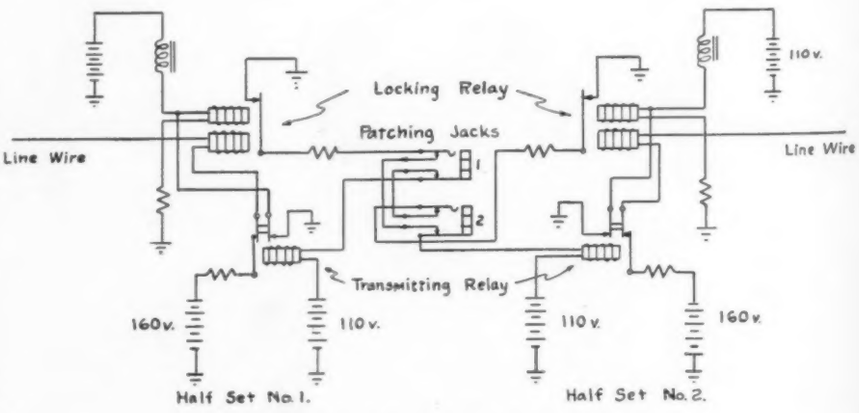

Fig. 41—Front-contact shunt-locking single line repeater.

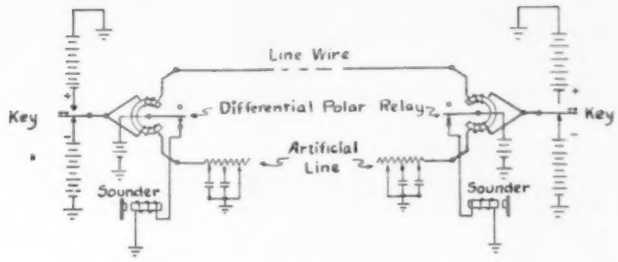

Fig. 42—Differential polar-duplex circuit theory.

with a storage battery in case of power failure. In smaller offices rectifiers may be employed which give good service. A typical rectifier unit having an output of 200 ma. is shown in Fig. 40. This employs a vacuum tube having a life of several thousand hours. Electrolytic and copper-oxide rectifiers are also employed in a similar fashion.

The single line Morse system described above is inherently slow due to the effect of line capacity and leakage. For this reason, long printer circuits are impracticable on such lines and hand Morse operation becomes very sluggish during wet weather. Single line telegraph repeaters have been developed whereby the signal is given additional energy thus permitting circuit lengths up to 500 or 600 miles. Operation in dry weather is quite satisfactory but becomes rather difficult during periods of low insulation especially if extending over a major portion of the line. There are many kinds of single line repeaters. However, all involve the same principles and consist of a receiving relay, transmitter and holding device. A complete repeater consists of the above elements in duplicate; a schematic diagram showing the wiring is shown in Fig. 41. This is known as the front-contact shunt-locking type single line repeater. The principle of operation is quite obvious and can be readily followed from the diagram. When the east operator opens his key the east line locking relay opens which in turn opens the west transmitting relay. This opens the west line and at the same time holds the west line locking relay in the closed position by means of the auxiliary contact on the transmitting relay. You will note that the circuit wiring includes patching jacks whereby each half of the repeater may be picked up and transferred to any other line. The equipment terminating each line is known as a **half set**. It may be used to connect the single line circuit to other types of telegraph facilities, such as duplex or carrier circuits.

Where high grade facilities are required, such as on printers and long Morse telegraph circuits the differential duplex circuit is employed. This utilizes polar relays which operate on current reversals and are therefore much faster and less subject to signal distortion caused by variation in line insulation. The schematic diagram of the differential polar duplex circuit is shown in Fig. 42. This scheme provides for simultaneous transmission of telegraph signals in both directions. The principle of operation is as follows:

The artificial line is made equal in characteristics (within practical limits) to the actual line wire which is terminated at the far end with a similar differential polar duplex set. Under such conditions, current will flow from the line battery through both windings of the differential polar relay in equal amounts. The connections to the windings on the polar relay are such that the current sets up opposing magnetic forces such that the armature does not react thereto. At the distant station the current flow divides through the two possible paths to ground but in so doing sets up a magnetic field which operates the armature. This is the familiar Wheatstone bridge principle which we will have occasion to refer to in subsequent discussions both in testing and in telephone repeater operation.

Fig. 43 shows a more detailed circuit arrangement of a terminal duplex set. The values shown are representative of those commonly used in present day equipment. Line battery of 160v. is commonly employed. The polar relays operate very satisfactorily on a current of 35 ma. On high speed printer circuits, it is sometimes advisable to increase the current to 50 ma. This represents the current as read on the milliameter which is also differentially wound and indicates the operating current through the relay. On hand Morse sending 15 ma. current is satisfactory. The line current is generally controlled by means of the resistance box located in series with the line and artificial line. The actual current in the line varies from zero to about twice the current read on the differential milliameter. Table 12 shows the line current and relay current under various key conditions for a typical polar duplex circuit. These values are approximate and serve merely to illustrate the relative magnitude of current in the differen branches. However, they represent

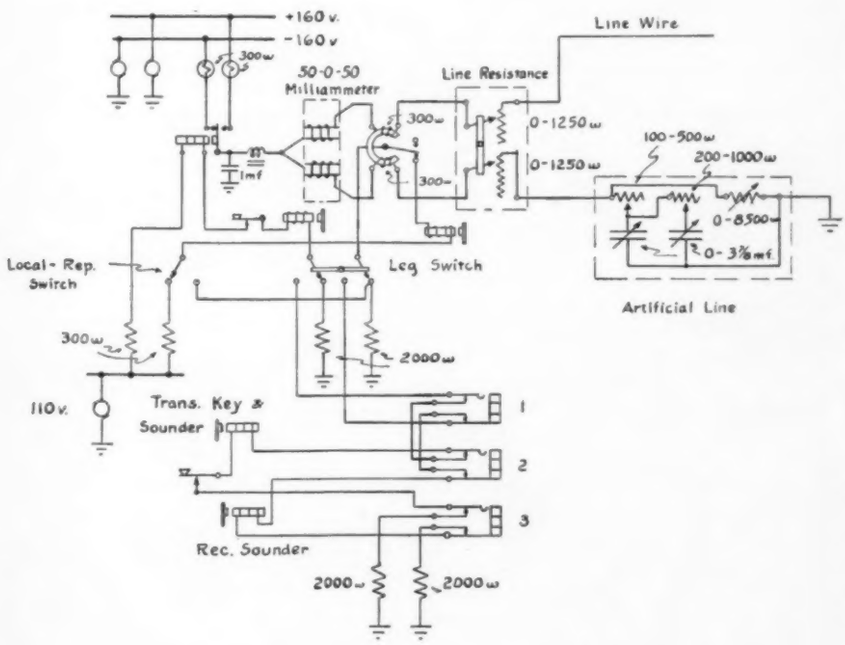

Fig. 43—Details of differential polar-duplex terminal set.

(Please turn to page 42)

By C. K. BROWN

Switchboard Maintenance

In this installment Mr. Brown discusses defects and faults in P. B. X. equipment and describes methods of finding and eliminating them

PART III

● The variety of defects and faults that develop in P. B. X. switching equipment and met with in practice may be divided into two general classes. First, those where the equipment fails to operate or perform the mechanical functions it is designed for and intended to meet aside from the transmission of speech, and second, the failure to transmit speech at all, or only imperfectly.

In the practice of maintaining P. B. X. switchboards it is soon discovered that a small percentage of the troubles developed in the switchboard are visible. Of course, some of the faults are at times visible, but in the majority of cases the cause of the trouble is invisible, therefore, it is unwise for the P. B. X. maintenance repairman to immediately start to dismantle the apparatus. In fact, it is good practice not to remove or alter any part of the equipment until he is absolutely certain where the trouble lies. A few minutes of careful thought frequently saves hours of time.

The best plan is to first develop a system by means of which the troubles are located. Usually considerable information may be obtained relative to the nature of the reported trouble by first listening to what the P. B. X. switchboard attendant has to say concerning it, at the same time asking questions regarding the action of the particular circuit or piece of apparatus involved.

● After hearing the attendant's testimony, it is well to test the various circuits or equipment involved. By coupling the attendant's version with what is observed during the testing procedure, that is, appreciating the difference between the descriptions of the trouble and the manifestation of that trouble, the repairman may be able to arrive at a definite conclusion regarding the nature of the fault, as he then has some data from which to draw.

In any systematic plan adopted for the purpose of locating and clearing P. B. X. switchboard troubles, a thorough understanding of the circuit wiring and equipment operation is of first importance.

In order to bring out some very important principles in the study of P. B. X. circuits, consideration will be given to a fundamental type of circuit, namely a series circuit. There are four facts concerning every series circuit: (1) The electric current flowing is uniform throughout. (2) The E. M. F. over the different portions of a series circuit is proportional to the resistance of these portions. (3) The total resistance in ohms is the sum of the individual resistances. (4) The effective E. M. F. is equal to the alegbraic sum of all the E. M. F.'s acting in the circuit.

Fig. 1

● A series circuit as the name implies, consists of several individual parts so connected that the current flows through each consecutively. Fig. 1 shows such a circuit. In this circuit the current must be of the same value every place from the very nature of an electric current itself. The total resistance offered to the flow of current, is the sum of the separate resistances which makes up the circuit, that is, the total resistance is equal to $\mathbf{R}_1+\mathbf{R}_2+\mathbf{R}_3$. The sum of the individual E. M. F. drops across each resistance which is a part of the circuit must equal the E. M. F. at the terminals of the source. That is, the E. M. F. **"C" to "D"** plus **"D" to "E"** plus **"E" to "F"** must equal the E. M. F. across **"A" to "B".**

From the above it follows that the E. M. F. across any two points in the circuit must equal the E. M. F. at the source, less the E. M. F. drops between the source and the two points.

The electric current which flows through a circuit built up as shown in Fig. 1, also flows through the internal part of the device which produces the E. M. F. This may be the electrolyte between the plates of a cell, or the wire which composes the winding of a generator. In any event, the material which carries the current through the source of E. M. F. from one terminal to the other, has resistance, which is called internal resistance.

● Since an E. M. F. is required to cause a current to flow through a resistance there will be an E. M. F. drop within the source itself when a current flows.

The terminal E. M. F. when a current flows will not be equal to the E. M. F. produced (called the open circuit E. M. F.) but will be less than this amount by the drop in E. M. F. due to internal resistance.

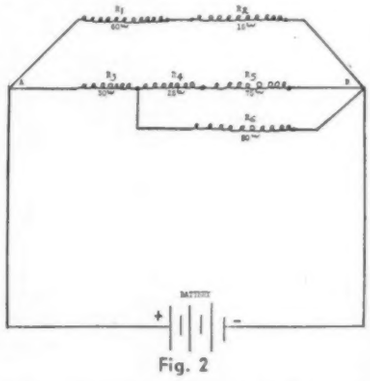

Fig. 2

Many electrical circuits in P.B.X. practices contain combinations of series and parallel arrangement. As an illustration

of the formation of a combination of series and parallel circuit connections, six different resistances designated R_1, R_2, R_3, R_4, R_5, R_6 are connected together as shown in Fig. 2, and in turn to the terminals of a battery.

It will be seen from an inspection of the connections, that the resistance R_1, and R_2, are joined in series and form one path between the points **"A"** and **"B"**, that the resistances R_4 and R_5 are in series with each other and the combination is in parallel with the resistance R_6 and that the combination R_4, R_5, and R_6 is in series with the resistance R_3 and forms another path between the points **"A"** and **"B"**.

A very important study of series and parallel circuits is the relation of the fall of potential or as commonly termed, voltage drop, through any portion of a circuit.

Fig. 3

● To obtain a clear idea of the voltage drop along a conductor an investigation of the properties of a long water pipe will be considered. If the pipe as shown in Fig. 3, be connected to a tank of water and the end at **"C"** is closed, a certain pressure will be developed at **"A"**.

Assuming this pressure to be 24 pounds per square inch, as long as the valve at **"C"** is closed, the same pressure is exerted at **"C"**. If the valve is opened, allowing a flow of water the pressure at **"C"** will immediately drop to nearly zero. While at **"B"** the pressure will be between that at **"A"** and at **"C"** or say 10 pounds per square inch. In other words, there will be a gradual decrease in pressure from **"A"** to **"C"**. The fall of pressure from **"A"** to **"B"** plus that from **"B"** to **"C"** must equal that from **"A"** to **"C"**, furthermore, the fall of pressure is proportional to the flow of water and also the resistance of friction inside the pipe.

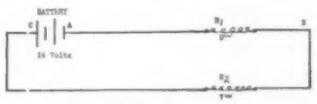

Fig. 4

An analgous condition exists in an electric circuit as shown in Fig. 5. In this circuit the total E. M. F. 24 volts is exerted between the points **"A"** and **"C"** corresponding to the pressure of water in Fig. 4.

Due to the flow of electric current through the resistance of the circuit in Fig. 4 the E. M. F. gradually decreases from **"A"** to **"C"**. As the total resistance is 12 ohms 5/12 of the E. M. F. will be used in R_1, that is, the E. M. F. between **"A"** and **"B"** will be 5/12 of 24 or 10 volts. The E. M. F. between **"B"** and **"C"** will then be 14 volts.

● The E. M. F. across R_2 is then I_2 R_2 or 2 times 7 equals 14 volts, and the total voltage drop 10 + 14 equals 24 volts or the total E. M. F. of the battery.

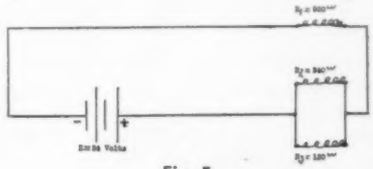

Fig. 5

An additional example is illustrated in Fig. 5. In this circuit the resistances R_2 and R_3 are connected in parallel, and R_1 is connected in series with the parallel portion of the circuit.

So far circuits having but a single source of E. M. F. have been considered. By recalling the fact that every source of E. M. F. tends to send an electric current in a definite direction, namely, from the positive pole of the source to the negative pole.

It is apparent that a second E. M. F. can be connected into a series circuit in two ways, that is, to try to send a current in the same direction as the one already flowing, or to oppose the existing current.

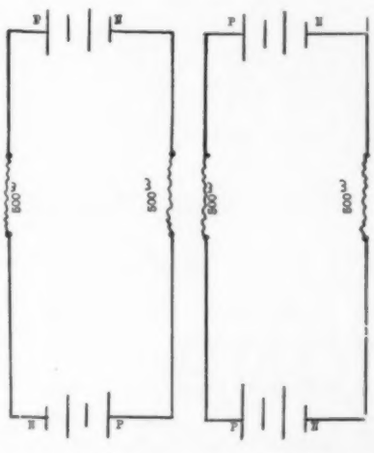

Fig. 6a

Fig. 6b

Fig. 6a and Fig. 6b show series circuit with a second source of E. M. F. connected in. In Fig. 6a, the electric current flowing around the loop would be in the same direction if either E. M. F. was replaced by a piece of wire. Therefore, a condition exists similar to coupling two locomotives to a train of cars to obtain a greater pull, and in the case of the batteries the total E. M. F. to cause the electric current to flow will be the sum of the E. M. F., that is the total E. M. F. is **24+16=40 volts.**

● The value of the current in the circuit will be by Ohm's Law: $I = \frac{E}{R}$

or $\frac{40}{1000} = 0.040$ **amperes.**

In Fig. 6b, the currents which would be produced by each E. M. F. if it were in the circuit alone, are in opposite directions.

It is therefore reasonable to suppose that there will be less current flowing when both E. M. F.'s are in the circuit than when each is present alone. This can be said to be due to the fact that the two E. M. F.'s are "bucking", that is, opposing each other, or in other words, the E. M. F. of one tends to neutralize the effect of the other. If the two E. M. F.'s are equal, no current will flow through the connecting wires. Two equal forces, acting in direct opposition, produce equilibrium. If however, the forces are unequal, then motion is produced in the direction of the greater force.

For example, if two groups of unequal E. M. F.'s are connected in opposition, a current will flow through the connecting conductors in the direction dictated by the higher E. M. F., that is, the current actually produced will be the same as that which would be produced by the larger E. M. F. if it were acting alone. The opposing E. M. F. is called the counter E. M. F. and is usually represented by **"e"**. The value of the current therefore, will be determined by the difference of these E. M. F.'s, or by formula

$I = \frac{E-e}{R}$.

In the case of Fig. 6b, the E. M. F., which will be effective in causing the current to flow, will be **E-e or 24-16 = 8 volts,** and the value of the current will be **8/1000 = 0.008 amperes.**

It is seen that Ohm's Law still holds for circuits with more than one source of E. M. F. with the understanding that the E. M. F. value to use is the E. M. F. actually effective in producing a flow of current.

An example of a series parallel circuit containing more than one source of E. M. F. is the battery supply to a P. B. X. at which there is located a storage battery "floated" on feeders from the central office storage battery. The term "floated" indicates the fact that the battery at the P. B. X. is permanently connected to the feeder, and may at different times be either charged or discharged, depending on the amount of current being used at the P. B. X.

(Please turn to page 44)

LINE and DESK

RAY BLAIN, Member A. I. E. E., Editor

Q. What side of a pole is known as its face?

A. The side of the pole on which the crossarm is attached is known as its face.

Q. What is the copper resistance per loop mile of No. 22 gauge cable?

A. The figure generally used is 176 ohms per mile.

Q. What type of poles should be stepped?

A. Terminal poles, test poles and all others climbed frequently should always be stepped.

Q. What is the approximate number of carbon granules in a present day telephone transmitter?

A. The ordinary transmitter button generally contains about 3,000 carbon granules.

Q. What is the alternating current output of a hand generator?

A. The output of a five-bar hand generator is ordinarily about 80-volts at 20-cycles.

Q. Is it true that there is available a combination electric hammer and drill, suitable for telephone work?

A. Yes such a drill has only recently been placed on the market. The drill part of this hammer is of the conventional type and uses regular twist drills up to 5/16 of an inch. Less than one minute's time is required to clamp on the hammer member and you have a combination electric hammer and drill which strikes 2400 hard blows per minute. This drill is rugged in construction though light enough in weight that a man may use it with comfort and safety while standing on a ladder. This tool will drill a hole as large as 1⅛ inches in concrete, stone or brick at a rapid rate. It may also be used to chisel, chip or scale and vibrate concrete forms to loosen them.

A clever little clamp converts the drill to a bench grinder when the necessary grinding wheel is attached. Rag or wire polishing and buffing wheels may also be used to advantage. This combination drill outfit is actually a miniature machine shop which packs into a small metal carrying case. We will be glad to give further information on this tool.

Q. How does the life of an untreated pole compare with one properly treated?

A. Many factors would enter into such a calculation though roughly speaking the treated pole will last approximately three times longer than the untreated ones.

Q. Is the use of tree wire considered desirable?

A. It is always preferable to reroute lines or trim trees if possible. If such action cannot be taken then tree wire is generally strung as a last resort.

Q. What weight will the ordinary pole derrick handle safely?

A. This will depend upon the size and type of derrick used. Usually the light weight derrick is rated at about 3,000 lbs. and the heavy derrick at 8,000 lbs.

Q. What type of condensers are most suitable for telephone work?

A. Paper condensers are almost universally used in telephone work due to cheapness and high capacities for their size. Mica condensers are good, though expensive. Electrolytic condensers have been used to a limited extent in telephone circuits.

Q. Please indicate a satisfactory method of splicing parallel type drop wire to house wire?

A. We would suggest the use of a small connecting block. These blocks can be purchased for a few cents each and make a much better and neater job than a taped splice.

Q. What is considered adequate protection for subscribers station equipment?

A. Such protection on exposed lines usually consists of open-space cut-outs and seven-ampere fuses. Some companies use a three or five-ampere fuse claiming that the seven-ampere is so large that is offers very little protection.

Q. Is a one tube rectifier of the electron tube type suitable for charging telephone storage batteries?

A. One tube ordinarily provides only half-wave rectification and for smooth current necessary to prevent noise on a telephone system full-wave rectification is necessary. Full-wave rectification requires two tubes or one double-anode tube.

Q. How can face plates of outside type cable terminals be cleaned after they become dirty?

A. They can be easily cleaned with clear water and a brush. Binding nuts should all be well tightened before

(Please turn to page 50)

QUESTIONS

Here's a question I should like discussed in Line and Desk

_____

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Name & Address: _____

List of Approved R E A Projects; Locations

● TELEPHONE ENGINEER has received several requests for the publication of the list of projects approved by the Rural Electrification Administraion, giving the states and counties in which the projects are located. The list has been received from the REA headquarters in Washington and it is being published below. The list includes approved projects up to and including August 19.

This information is being passed on to telephone companies in order that they may inquire as to the extent of the projects for their communities and if they interfere in any way with telephone service.

● Under the headings of "Projects Under Construction or Completed"; "Construction Specifications Approved"; "Loan Contracts Executed" and "Allotments Approved" are listed the following REA projects:

ALABAMA: Clarke - Washington County Power Ass'n. Inc.; Cullman County Electric Membership Corp. (Cullman County)

ARKANSAS: Rural Light & Power, Inc.; Rural Electric Co.

COLORADO: Grand Valley Water Users Ass'n.

DELAWARE: Company to serve Sussex and Kent Counties.

FLORIDA: Florida Public Service Co.

GEORGIA: Georgia Power & Light Co.; Crisp County Farmers Coop. Ass'n.; North Georgia Electric Membership Corp. (Catoosa, Whitfield, Dade, Chattooga, Floyd, Murray, Gordon, Walker Counties); Rayle Electric Ass'n.; Toombs County Rural Electrification Ass'n.; Troup County Rural Electrification Corp.; Snapping Shoals Power & Light Co., Colquit County Rural Electric Co. (Colquitt, Brooks, Mitchell, Thomas, Tift and Worth Counties); Walton Agricultural Ass'n. (Walton, Morgan, and Barrow counties); Company to serve Heard and Carrol Counties; Douglas County Electrification Committee (Douglas, Carroll, Cobb, and Paulding Counties).

IDAHO: Northern Idaho R. E. Rehabilitation Ass'n.

ILLINOIS: Suburban Electric Corp.; Farmers Mutual Electric Co.; City of Mascoutah; Scott County Electric Corp. (Scott County); Pike County Electric Corp. (Pike, Calhoun, Scott and Adams Counties); Menard County Electric Corp. (Menard, Sangamon, Cass and Logan Counties); Rural Electrification Convenience Coop. (Sangamon, Christian, Montgomery, Morgan and Macoupin Counties); Company to serve Shelby, Carroll and Crawford Counties.

INDIANA: Indiana State Wide R. E. M. C.; Whitley County Rural Electric Membership Corp.; Shelby County R. E. M. C. (Shelby and Hancock Counties); Bluffton Municipal Light & Water Works; Henry County R. E. M. C. (Henry, Delaware, Fayette, Hancock, Madison, Randolph, Rush and Wayne Counties.); Huntington County R. E. M. C. (Huntington, Allen, Grant, Wabash, Wells and Whitley Counties); Boone County Rural Electric Membership Corp. (Boone County).

IOWA: Central Iowa Power Co.; Eastern Iowa Light & Power Coop. (Scott, Muscatine, Cedar, Louisa and Johnston Counties); Boone Valley Electric Coop. (Wright, Humboldt and Hancock Counties); Adams County Coop. Electric Co.; City of Hawarden; Town of Glidden; City of Gowrie; Amana Society; Monona County R. E. Coop. (Monona, Woodbury and Harrison Counties); Village of Sumner; Shelby County R. E. Coop. (Shelby, Cass, Harrison and Pottawattamie Counties); South Crawford Rural Electric Cooperative (Shelby, Carroll and Crawford Counties); Calhoun County Rural Electric Coop. (Calhoun, Webster, Carroll and Sac Counties); Harrison County Rural Electric Coop. Ass'n. (Harrison, Monona, Crawford and Pottawattamie Counties).

KANSAS: Cooperative Power & Light Co.

KENTUCKY: Kentucky Rural Electrification Co. (Lee, Owsley and Fleming Counties); Columbus Light & Power Co. (Hickman and Carlisle Counties); Henderson County Rural Electric Ass'n.

MARYLAND: Consumers Coop. Co.; Company to serve St. Mary County.

MASSACHUSETTS: Franklin County Electric Coop. (Franklin and Hampshire Counties).

MICHIGAN: Ingham County Electric Coop. Inc. (Ingham, Eaton, Jackson and Livingston Counties).

MINNESOTA: Meeker Coop. Light & Power Ass'n.; Lake County Coop. Power Ass'n.; Farm Electric Service Co.; Douglas County Coop. Light & Power Ass'n.; McLeod Coop. Power Ass'n.; Wells Electric Ass'n.; Federated Rural Electric Ass'n. (Jackson and Martin Counties).

MISSISSIPPI: Monroe County Electric Power Ass'n.

MISSOURI: Boone County Electric Coop. (Boone, Cooper and Moniteau Counties); Marion County Electric Coop. (Marion, Lewis, Monroe, Shelby and Ralls Counties); Lewis County Electric Coop. (Lewis, Clarke and Marion Counties); Calloway County Electric Coop. (Calloway County).

MONTANA: Hurley Project Development Ass'n.

NEBRASKA: Southeastern Nebraska Public Power District (Adams, Kearney and Phelps Counties); Roosevelt Rural Public Power District (Scotts Bluff County); Gering Valley Rural Public Power District (Scotts Bluff County) Lancaster County Rural Public Power District; Eastern Nebraska Public Power District (Richardson, Johnson, Pawnee, Otoe and Nemaha Counties); Loup River Public Power District; Elkhorn Valley Rural Power Co.

NORTH CAROLINA: Tidewater Power Co.; Wilson County Electric Membership Corp.; Johnston County Electric Membership Corp. (Johnston, Wake and Harnett Counties); Edgecombe-Martin County Electric Membership Corp.; Glenview Cooperative (Nash and Halifax Counties).

NORTH DAKOTA: Cooperative Electric Service Co.

OHIO: Pioneer Rural Electric Coop., Inc.; Logan County Coop. Power & Light Ass'n.; Holmes Rural Electric Coop., Inc.; Lorain-Medina Rural Electric Coop., Inc.; Inter-County Rural Electric Coop., Inc. (Pike, Highland, Clinton, Ross and Fayette Counties); Union Rural Electric Coop., Inc. (Union, Marion, Logan and Delaware Counties).

OKLAHOMA: Earl W. Baker Utilities Co.; Wolverton Bros. Light & Power Co.

PENNSYLVANIA: Northwestern Rural Electric Coop. Ass'n. (Crawford and Erie Counties).

SOUTH CAROLINA: State Rural Electrification Authority; Greenwood County.

SOUTH DAKOTA: Fairview Rural Electric System.

TENNESSEE: Meigs County Electric Membership Corp.; City of Dayton.

TEXAS: Bartlett Community Light & Power Co.; Belfalls Light and Power Co. (Bell, Falls and Milam Counties).

VIRGINIA: Farmers Rural Utilities, Inc. (Caroline, Spotsylvania, Hanover and Orange Counties); Shenandoah Valley Electric Coop.; Virginia East Coast Utilities, Inc.; The Bull Run Power Co.

WASHINGTON: Public Utility Dis-

trict No. 3 (Mason County); Mutual Power & Light Ass'n.

WEST VIRGINIA: Barbour Power Co. (Barbour County).

WISCONSIN: Columbus Rural Electric Coop.; Richland County Electric Coop. Ass'n.; Dane-Iowa Electric Coop.; City of Hartford; Buffalo County Electric Coop. Ass'n. (Buffalo and Trempealeau Counties); Head-O-The-Lakes Coop. Electric Ass'n. (Douglas County); The Chippewa County Light & Power Coop. Ass'n.; Trempealeau County Coop. Ass'n. (Trempealeau, Eau Claire, Buffalo, LaCrosse and Jackson Counties); Rock County Electric Coop. Ass'n. (Rock, Dane and Walworth Counties); Oakdale Electric Coop. Ass'n. (Monroe and Juneau Counties); Pierce County Rural Electric Coop. Ass'n. (Pierce and Pepin Counties); Grimh Power Company; Barron County Electric Coop. Ass'n. (Barron and Washburn Counties).

WYOMING: Company serving Goshen County.

REA To Pay Costs of Interference Elimination

In a decision on August 19 the Iowa State Board of Railroad Commissioners grants the application for multi-grounding in rural electrification projects on a temporary basis and requires electric companies using this type of construction to remedy interference trouble and to make cost settlements with telephone companies in advance of the construction of the lines.

The decision was in connection with request of the Citizens Power & Light Co., Council Bluffs, Ia., to install multiple grounds on primary neutral of single and three phase star or "Y" connected voltage suitable for rural electrical service.

The case was started April 16, 1935 and the Iowa Telephone Association has vigorously opposed the granting of the power company's request.

The commission's decision follows:

"Under the provisions of Chapter 383, Code of Iowa, 1931, and in the exercise of the powers conferred therein,

"WHERAS, on the 16th day of April, 1935, the Citizens Power and Light Company, Council Bluffs, Iowa, filed with the Board of Railroad Commissioners of the State of Iowa, a written request for authority to install multiple grounds on the primary neutral wire of its electrical supply circuits serving rural areas in Mills and Pottawattamie Counties, Iowa; and

"WHEREAS, this matter was assigned for public hearing and was heard in the office of the Board of Railroad Commissioners at Des Moines, Iowa, on the 21st day of May, 1935, at ten o'clock a. m.; and

"WHEREAS, on the 5th day of June, 1935, the Board of Railroad Commissioners issued an Order which provived, among other things, for said Citizens Power and Light Company, to install, for test purposes, additional ground connections on the neutral wire of its Wye connected rural power distribution circuits; for a joint study and investigation to be made by both electrical supply and communication companies to determine the inductive influence of Wye connected multi-grounded neutral power distribution circuits on exposed communication circuits at roadway separation; for a written technical report of this investigation to be made to the Board of Railroad Commissioners; and

"WHEREAS, this investigation was made and a technical report of the investigation, dated February 26, 1936, signed by T. A. Taylor for the Bell Telephone Laboratories, and H. W. Wahlquist for the Edison Electric Institute, has been filed with the Board of Railroad Commissioners; and

"WHEREAS, the Joint General Committee, which directed the investigation, did not agree as to what recommendation should be made to the Board of Railroad Commissioners of the matters in question and recommended a further public hearing to be held; and

"WHEREAS, a further public hearing was held in the office of the Board of Railroad Commissioners at Des Moines, Iowa, on July 21, 1936, at ten o'clock a. m., and evidence was submitted by the applicant and the objectors; and

"WHEREAS, this Commission heard and has carefully considered the testimony presented at the hearing on July 21, 1936, and has read no other brief being filed, and has carefully weighed the information contained in the technical report dated February 26, 1936, and is of the opinion that the data available on the subject of inductive influence of Wye connected multi-grounded primary neutral rural power distribution circuits on communication circuits, both metallic and ground return, is not conclusive, and that additional information should be made available for further consideration covering inductive influence of Wye connected multi-grounded primary neutral power distribution circuits on exposed communication circuits, both metallic and ground return, before this Commission will issue a final order in this Docket; and

"Whereas, this Commission will consider approving the installation of other Wye connected multi-grounded primary neutral rural power distribution circuits operating at voltages suitable for rural electric service outside of cities and towns, so that additional information may be available covering inductive influence of such circuits on exposed communication circuits, both metallic and ground return, providing certain conditions will be met, to-wit: the company proposing to construct Wye connected multi-grounded primary neutral rural power distribution circuits shall negotiate with communication companies whose circuits will be exposed on the same highway to the proposed power circuits, to the effect that the power company will comply with the Decision and Order adopted by the Board of Railroad Commissioners of the State of Iowa, on December 30, 1916, covering Electrical Interference between Transmission, Telephone and Telegraph Lines, in making ground return telephone circuits metallic and other inductive coordination problems involved, and that the financial settlement will be made with the communication companies before starting construction of such power circuits.

"IT IS HEREBY ORDERED, that the Citizens Power and Light Company, Council Bluffs, Iowa, is authorized to reconstruct its Wye connected rural power distribution circuits in Mills and Pottawattamie Counties, Iowa, and install multiple ground connections on the neutral wire of said distribution circuits providing that an agreement is made as to the settlement of inductive coordination problems involved with communication companies operating communication circuits exposed at highway separation to the power distribution circuits of said Citizens Power and Light Company; and

"IT IS FURTHER ORDERED, that the Board of Railroad Commissioners will consider the installation of other Wye connected multi-grounded primary neutral power distribution circuits operating at voltages suitable for rural electric service, outside of cities and towns, providing the company proposing to construct Wye connected multi-grounded neutral rural power distribution circuits will complete negotiations with communication companies having circuits which will be exposed on the same highways to such power circuits, to the effect that the power company will comply with the Decision and Order adopted by the Board of Railroad Commissioners of the State of Iowa, December 30, 1916, covering Electrical Interference between Transmission, Telephone and Telegraph Lines, in the financial settlement of making ground return telephone circuits metallic and other inductive coordination problems involved, before

this Commission will approve applications to install Wye connected multi-grounded primary neutral power distribution outside of cities and towns; and

"IS IS FURTHER ORDERED, that this Order is being approved in this manner until further data is available on the operation of Wye connected multi-grounded primary neutral rural power distribution circuits and inductive rural power distribution circuits and inductive influence of such circuits on exposed communication circuits at roadway separation, both metallic and ground return, and when the data is available this Commission will give the matters involved in this Docket further consideration; and

"IT IS FURTHER ORDERED, that in the event the companies proposing to install Wye connected multi-grounded primary neutral rural power distribution circuits and communication companies, whose circuits will be exposed at roadway separation to the proposed power circuits, cannot complete negotiations as to the financial settlement of the amount involved by making ground return telephone circuits metallic and other inductive coordination problems involved, this matter may be referred to the Board of Railroad Commissioners for final disposition, and the financial settlement shall be made with the communication companies before starting construction of the power circuits; and

"IT IS FURTHER ORDERED, that at the expiration of two years from the date of this Order, the matters involved in this Docket will come before the Board of Railroad Commissioners for final Decision and Order; and

"IT IS FURTHER ORDERED, that the Board of Railroad Commissioners reserve the right to deviate from any provisions in this order where it seems advisable so to do; and

"IT IS FURTHER ORDERED, that no provisions in this Order shall annul or modify any Rule or Order now in effect governing the construction, operation and maintenance of the electrical supply lines in situations where this Commission has jurisdiction."

A submarine telephone cable has been laid along the bed of the Plata River in Argentina to provide telephone service between that country and Uruguay. The cable contains 18 circuits and extends from Buenos Aires to Colonia, where it connects with a 140-mile circuit to Montevideo.

A. T. & T. Plans Record Issue of 175 Million

A move by the American Telephone & Telegraph Co. to float a $175,000,000 loan for repayment of outstanding indebtedness held out to Wall street prospect of one of the largest pieces of corporate financing in its history.

It was the biggest private issue announced under the federal securities act of 1933 and since revival of the capital market started a corporate bond refunding movement early last year to cut down interest charges.

Directors of the company authorized the filing of a registration statement with the Securities and Exchange Commission on September 25, covering an issue of $175,000,000 of 3¼ per cent 25-year debentures.

With the proceeds the company planned to pay off before maturity $117,984,700 in 5 per cent debentures and $64,865,200 in 5 per cent bonds.

It was figured holders would receive a premium of about $15,000,000 for the repayment before maturity. But annual interest savings of around $3,000,000 are expected to make the operation profitable for the company in the long run.

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Magneto-Ringing-Set

One Rotating Element Only

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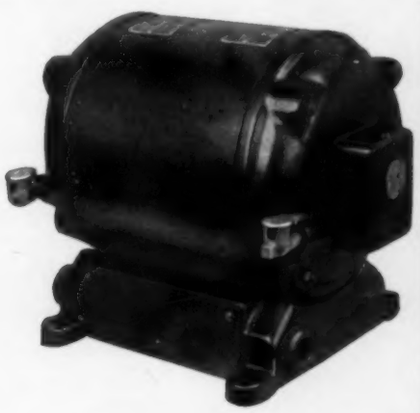
Nothing to Cause Radio Interference



Designed for Exchanges Up to 1500 Subscribers
Output—80 volts, 19 cycles, 15 watts
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Provides "Audible Ringing"
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Editorial « « «

Pulling Steadily Out

The advance in telephone stations throughout the nation is again cited among developments pointed to as evidence that this country is pulling steadily out of the depression.

The low record of the depression for telephone installations was reached in August 1933. The depression drop in telephones amounted to 17 per cent. From 1933 to 1936 the industry made up approximately 40 per cent of this loss and present indications point to a further advance by the end of the year. A close study of the "Monthly Telephone Station Barometer" in this issue will show clearly the progress made by the industry. Of particular significance is the fact that this year there were net gains made in telephone installations during June and July, which produced losses in 1933, 1934 and 1935. These are seasonal low months and in normal times they usually show smaller gains in installations, but it is gratifying to note that once more they are producing net gains instead of losses.

With general business continuing its upswing, it is expected that telephones in service will top all past records sometime in 1938. It is predicted that the previous peak reached in 1930 will be regained by the latter part of 1937.

This upward trend can mean only one thing to operating companies. With predictions of increased business beyond previous marks, they should resume their construction, rehabilitation and repair work to get their plants in shape to take care of this increased business that is due to come and to be able to maintain the highest grade of telephone service for the public.

★ ★ ★ ★ ★ CONVENTION EXTRA

AUTOMATIC ELECTRIC NEWS

Published Occasionally By
AUTOMATIC ELECTRIC COMPANY
1033 West Van Buren Street, Chicago

OCTOBER 10, 1936

Automatic's Exhibit Reflects Year's Progress

EXTRA!

Special Invitation

to

Convention Visitors

We take this opportunity to invite all telephone men to visit our factory and general offices at 1033 West Van Buren Street, where both production processes and finished products in endless variety await their inspection. Any representative of American Automatic Electric Sales Company will gladly make the necessary arrangements.

AUTOMATIC ELECTRIC COMPANY

Visitors Urged to Examine New Automatic Electric Creations

Telephone men attending the Independent Telephone Convention will find unusual variety and interest in the new developments in telephone apparatus which will be displayed this year. Such is the opinion voiced by R. W. Siemund, vice president of American Automatic Electric Sales Company, in a recent interview in which he outlined that company's plans for a convention exhibit.

"No one can accuse the telephone manufacturers of lagging behind in the matter of technical progress," said Mr. Siemund; "at least, not after looking over the products we are planning to put on display at our headquarters at the Stevens during convention week."

"What would you say is the most interesting development you are showing this year?" we asked Mr. Siemund.

"That's hard to answer," he replied. "Of course, all of these improved devices are interesting to the telephone man. But some of the least spectacular are of the greatest economic importance. Others are intensely interesting from a technical viewpoint, but are perhaps not quite so important commercially. In planning our exhibit we have tried to present a wide variety of both types of developments.

"Our newest development is shown in the unique exhibit of the new 'silent pawl' dial. We've retained the long-life Type 24 mechanism, but have entirely eliminated the 'click.' With this new dial, you can stand a few feet away from a person dialing a number, and I don't believe you'd even know he was making a call until he began to talk.

Amplifier Shows Improvement

"To show the remarkable improvement, we have had samples of the old and new dials fitted with an amplifier and loud speaker. No one should leave the convention without witnessing this demonstration and examining this remarkable dial."

Show Attractive Exhibit of New Art Shade Monophones

One of the first things at the convention which every telephone man will want to see, is the exhibit of new Automatic Electric Monophones, especially the two popular self-contained models — the Type 34A3 desk Monophone and the Type 35A5 wall-mounting Monophone.

To the telephone user, these Monophones have an unusual appeal, due to their distinctive modern styling which makes them a decorative asset in any room or office. He appreciates their new convenience of operation, which makes every telephone call a comfortable and pleasurable experience, rather than a bothersome duty.

The telephone man sees even more of advantage in the rugged, durable Monophone construction, in the high quality, standard-sized parts, and in the easy manual to automatic conversion feature. Visitors to the Convention are urged to see the complete Monophone line, including the colored models, presented in a choice of eight attractive art shades, with gold or chromium trim. The display is expected to be one of the most attractive at the convention.

"What are some of the other high spots of your exhibit," we inquired.

"Our display of automatic switching equipment naturally occupies the center of the stage," said Mr. Siemund. "This year we have gone to some pains to show—in as compact a space as possible—the various types of standard automatic switches which make up a complete automatic central office installation. Strowger Automatic equipment is so flexible in its mounting arrangement that to show a switchboard section as representing a 'standard' installation is somewhat misleading. The type and variety of mounting is determined by the local conditions—size of exchange, traffic, floor space, ceiling height, etc.—but the switches themselves are highly standardized products—and to illustrate their operation, we have set up individual switches in glass enclosed exhibit mountings where typical operations representing an exchange of any size can be conveniently observed.

"Our telephone display is always interesting, and particularly so this year because of the widespread success we have had with our two new Monophones, the Type 34A3 self-contained desk Monophone, and the Type 35A5 wall-mounting Monophone. We believe they're the most beautiful, most convenient telephones we've ever built—and judging from the sales figures for the last few months, there must be a lot of other people who hold the same view.

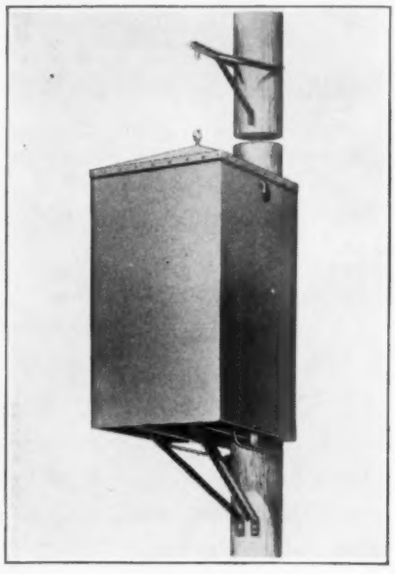
Nine-Line C-A-X

"In another room, we are going to set up a working model of one of our new pole-mounted automatic exchanges, in this case a Type 36A3 C-A-X. This is a completely unattended, full-automatic unit designed especially for outside mounting and has a capacity of nine lines."

"Isn't that rather small to be of practical use?" we asked.

"Frankly, that's what I thought when I first saw it," Mr. Siemund answered. "But one of the ideas behind it is that it will serve as a growth stimulant in backward areas, and that is exactly how it has worked out. Being compact and easily installed, it can quickly be replaced with a larger board, and moved elsewhere to achieve a similar result.

Pole-Mounted C-A-X



This drawing shows how the Type 36A3 C-A-X looks when installed on a pole. The cover is raised by means of a rope and pulley whenever there is occasion to inspect the equipment.

"Another recent development of great importance is the Automatic Electric Remote Control Toll Board. We are showing two positions of this cordless, automatic type switchboard, taken from a four position board which has been sold to the Delta Telephone and Telegraph Company for installation at Courtland, California. Every telephone man will want to see this new type toll board and learn about its time-conserving, labor-saving features.

Other Exhibits

"I won't try to describe our whole exhibit to you, but will just briefly mention that we have one display devoted to new items for the construction man, another given over to the latest developments in Automatic-Sands protection equipment, a specially designed loading coil demonstration set and a working exhibit of the Automatic Electric multiple pen recorder. These represent only the high spots, but you can tell all the telephone operating men for me that it will pay them to come and 'see the works' for themselves."

HERE'S CHANCE TO "SEE" OWN VOICE

Have you ever seen your own voice face to face? If not, you will have a splendid opportunity to do so at Automatic Electric Company's loading coil exhibit. Here a specially-designed cathode ray oscillograph has been set up, so that by talking into a microphone the electrical impulses which your voice sends along the telephone wires are broken up into their component waves and flashed on a ground glass screen. You'll be surprised to see how complex a wave form is set up by a simple sound, such as "a" or "ah"—and when you start to form whole words and sentences, the effect is somewhat like the jagged display of multiple lightning seen during a summer thundershower.

Amplifying Voice Waves

All of this is merely to demonstrate graphically what Automatic Electric loading coils do to a long telephone circuit. You can see how your voice waves traverse such a circuit, unequipped with any loading devices. Then Automatic Electric loading coils, properly spaced and balanced, are suddenly switched into the same circuit. The voice curves are immediately magnified many times, the sharpness and intensity of the "peaks" and "valleys" of the resulting curves also indicating true voice transmission with no distortion.

Uses New Alloy

By means of this interesting demonstration, the visitor can see the advantage of proper loading of telephone circuits to avoid excessive losses and voice distortion. Automatic Electric loading coils not only provide the highest type of performance, but due to the development of new magnetic alloys, are considerably smaller in size than previous loading coils of corresponding capacity. The exhibit is in charge of C. J. Larsen, one of Automatic Electric's transmission engineers.

Mr. Siemund said that American Automatic representation at the Convention would include some twenty sales representatives from out of town.

"Remote Control" Toll Board Betters Speed and Accuracy

Developed by Automatic Electric engineers to bring the same tremendous improvement in speed, accuracy and operating economy to toll switching that automatic switching equipment brings to local operation, the "Remote Control" Toll Board is attracting the attention of telephone engineers throughout the world.

Two positions of this cordless, automatic type switchboard are being shown at the convention—part of a four position board which is to be shipped to the Delta Telephone and Telegraph Company for installation at Courtland, California. Several installations of this new type toll board are in active daily service effecting appreciable operating economies. One of the largest orders yet received for this board consists of forty positions, recently shipped to Sao Paulo, Brazil, for the Brazilian Telephone Company.

No Cords, Plugs or Jacks

The Automatic Electric Remote Control Toll Board eliminates entirely all plugs, cords and jacks—the setting up of all connections being performed instantly and accurately by the same standard automatic switches that have been so satisfactorily used in local switching. The operator is concerned only with the operation of a few simple keys, and because of the increased concentration and lessened physical exertion, can handle more calls with greater accuracy and less fatigue than with the conventional type of board.

Modernizes Service

The Remote Control Toll Board is not just an alternate means of rendering toll service—it marks a definite forward step in the art of toll switching — so much so that even the latest types of cord boards must be regarded as out of date by comparison. Its use does not sacrifice or modify any of the present highly specialized toll switching practices. On the contrary, the introduction of automatic switches has permitted many improvements in service, faster, more accurate response, better connections. Former subscribers' complaints due to noisy cords, false disconnects caused by worn sleeves, and operator interference when reaching for jacks in adjacent positions, have been eliminated entirely whenever this board has been installed.

New "Remote Control" Toll Board

This installation at Monroe, New York, is one of several Strowger Remote Control Toll Boards installed by Automatic Electric Company. The actual connections are set up by switches instead of by cords, plugs and jacks.

"Cutaway" Finger Plate

Automatic Electric Company's new Type 24A36 Dial will be supplied if desired with cutaway finger plate as shown in the above illustration. This arrangement facilitates cleaning of the number plate.

It can be used with equal success either in conjunction with manual or with automatic central offices. Automatic Electric engineers urge that, whenever new toll switchboards or additions to existing switchboards are contemplated, telephone operating men give serious consideration to the adoption of this modern improved board. The two position exhibit at the convention offers an excellent opportunity for the study of its many definite advantages.

Two Wisconsin Towns to Convert to Automatic

The Urban Telephone Company, Clintonville, Wisc., has just placed an order for its fifth automatic switchboard—a thirty line Community Automatic Exchange for installation at Leopolis, Wisc. This company's use of automatic equipment dates from 1929, when its Clintonville exchange was converted. Three others followed in quick succession—Bowler, with 50 lines; Tigerton, with 100 lines, and Bear Creek, with 120 lines.

Belgium, Wisconsin, is also scheduled to have automatic service at an early date. The Belgium switchboard will be a thirty line C-A-X. The exchange is operated by the Mid-West States Telephone Company of Wisconsin, whose head office is at Fond du Lac.

Manual Switchboard Division Operates at Peak Capacity

Automatic Electric production officials report unusual activity in the manual switchboard department this year. While the forty-position toll board recently shipped to Brazil has accounted for much of that activity, orders for manual central office switchboards from the domestic field have also been plentiful.

Recent orders include a four-position Monotype central battery switchboard for the Hamilton, Texas, exchange of the Gulf States Telephone Company, a similar four-position switchboard for the Council Grove Mutual Telephone Company, Council Grove, Kas., a four-position remote control toll board for Courtland, Cal., a single position series lamp signal switchboard for the Sligo, Pa., exchange of the Leatherwood Telephone Company, and several miscellaneous manual switchboards for various Government departments.

Traffic Study Easy with This Machine

How long is it since you have made a complete, scientific study of your traffic conditions? Every telephone exchange should be subjected to such an analysis occasionally, to improve general efficiency and to properly forecast and plan additions of switching equipment to cope with changing and increasing traffic demands.

The Automatic Electric Multiple Pen Recorder is the ideal investigator to put on such a job. It consists of twelve electro-magnetically operated pens which record, simultaneously, twelve separate curves on the same moving paper chart. Rate of movement of the paper chart can be regulated and suitable time intervals indicated thereon, depending upon the operations to be recorded.

Thus a permanent and absolutely accurate record can be made of traffic and overflow conditions, an analysis of which will provide invaluable data for proper traffic planning and efficient allocation of switching units in exchanges, both small and large.

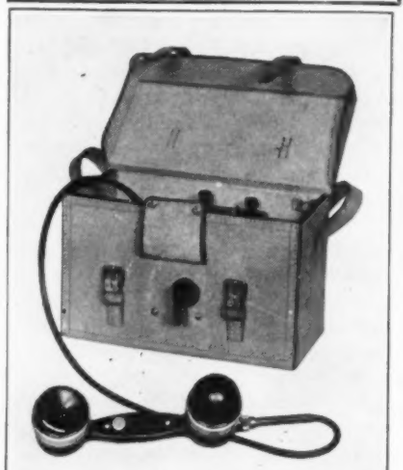
The Automatic Electric exhibit rooms at the Stevens contain a working display of the Multiple Pen Recorder, and is well worth a visit from every telephone man. Arrangements can be made, under certain conditions, to rent one of these recorders where it is needed for only a short time. Visitors can secure full information concerning the rental plan from any representative of American Automatic Electric Sales Company. The machine itself is a compact, portable unit, and is exceedingly flexible in its application to any type of telephone switchboard or trunk network.

Pennsylvania Company Adds to Automatic

With the recent installation of automatic equipment at its Emporium exchange, the Home Telephone Company of Ridgway, Pa., now has four of its seven exchanges operating on an automatic basis. The other three — Ridgway, Johnsonburg and St. Marys—were made automatic in 1929.

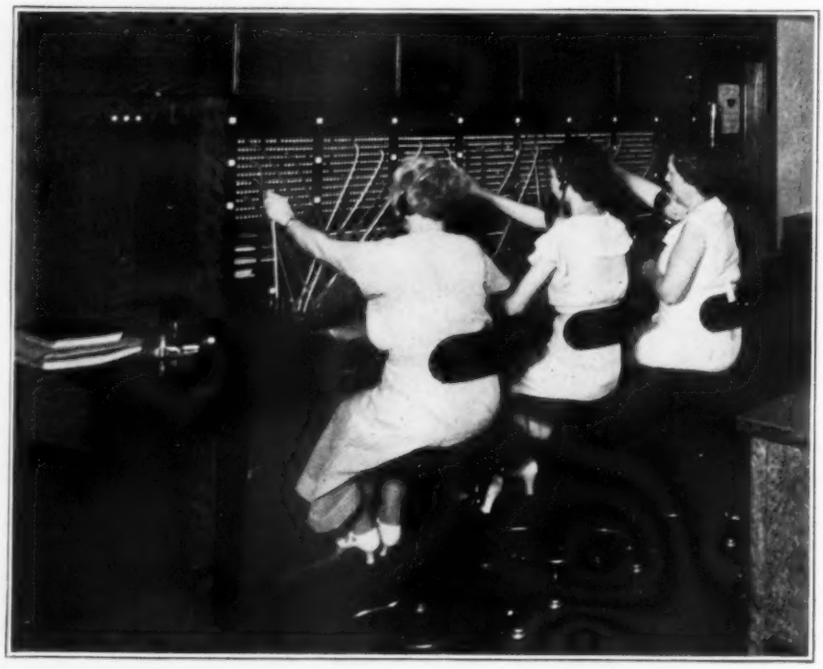
The installation at Emporium consists of 350 lines of Automatic Electric line finder equipment, which provides automatic service to individual, P. B. X. and multi-party lines.

Magnetic Telephone



This is one of the many practical adaptations of the Automatic Electric Magnetic Monophone—a telephone which operates over long distances without battery supply. See it in operation at the Convention.

Monotype Switchboards for Texas Company



This four-position Monotype steel-frame switchboard was recently installed for the Gulf States Telephone Company at its Commerce, Texas, Exchange. The company has recently ordered a similar switchboard for its Hamilton exchange.

New Dial Is Set To Better All Records

Newly Perfected "Silent" Dial Retains Basic "1000-Year" Mechanism, But Eliminates "Click" of Ratchet

Not content with having produced the quietest telephone dial so far placed on the market, Automatic Electric engineers have recently perfected a new dial incorporating the further improvement of an absolutely noiseless pawl. This new dial, known as Type 24A36, incorporates the same basic mechanism as that of the Type 24 Dial, which, when subjected to laboratory life tests, endured the equivalent of over one thousand years average daily service without failure of any kind. This record has never been approached by any other commercial dial.

The new Type 24A36 Dial, just perfected, uses the same basic, long-wearing Type 24 mechanism, with the addition of the "silent pawl" feature. The usual "click" of the dial ratchet has, for all practical purposes, been eliminated. All that can be heard is a quiet, subdued "whir-r-r-" as the dial returns to its normal position.

To demonstrate the quietness of operation of the new dial, Automatic Electric engineers have arranged a display with the old and new dials mounted side by side for convenient operation by any visitor. A microphone has been placed close to each dial, and wires from these lead to an amplifier and loudspeaker unit, so that all noises emanating from each dial are clearly audible.

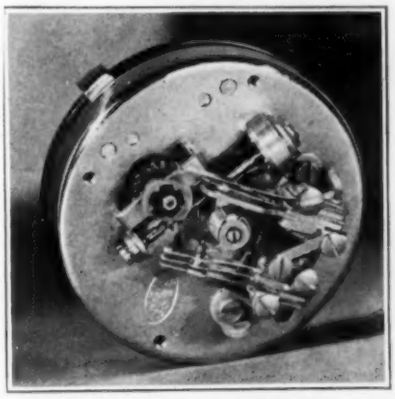
The operation of the old type of dial with the subdued ratchet click, sounds through the loudspeaker as a succession of sharp knocks. But with the new Type 24A36 dial, the ratchet sound, even over the loudspeaker, is scarcely audible.

In this exhibit, too, is shown the new "cutaway" finger plate, which is optional equipment on all orders for the new Type 24A36 dial. This plate has a section cut away between the "1" hole and the "0" hole, which permits easy cleaning of the number plate by merely inserting a cloth in the opening and rotating the finger plate a few times.

SPECIAL NOTICE!

For conveniently locating anyone who may be visiting the American Automatic exhibit rooms, the attendant in Room 2506 will be provided with a microphone. Connected to this will be several loud-speaker units placed strategically throughout the entire exhibit, permitting any desired person to be paged and summoned without delay. The loudspeakers will consist of a standard Magnetic Monophone unit coupled to a horn, providing a useful demonstration of loud-speaker operation without amplifiers.

New Dial



To make the Type 24 Dial even quieter than it has been seems almost like "gilding the lily." Yet that is just what Automatic Electric engineers have done. They have eliminated the ratchet clicks in the forward movement.

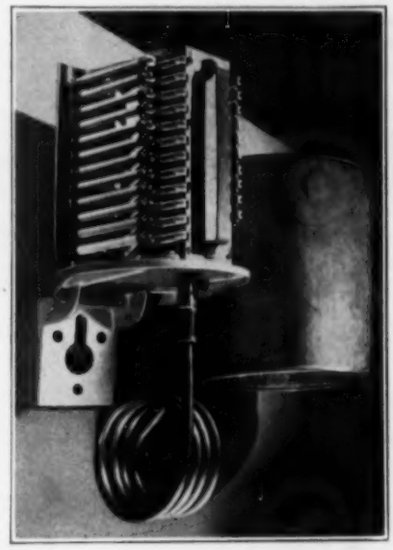
Lincoln Orders New Automatic Exchange

The Lincoln (Nebr.) Telephone and Telegraph Company, users of Strowger Automatic Equipment since 1904, has ordered a 1400 line automatic switchboard, for installation in a new exchange building now under construction. The area to be served by the new exchange will include the southeastern section of Lincoln and the suburbs of College View and Normal. The latter are now served by manual equipment. When this installation is completed, the entire city of Lincoln will have automatic service.

Show Complete Range of Protection Apparatus

Since Automatic Electric Company extended its manufacturing activities to include a comprehensive line of telephone protective equipment, the business of that department has shown continuous and increasing activity. Because of the high interest which telephone companies are showing in those products, the company will display a comprehensive selection of such apparatus at the convention.

Improved Terminal



This device—round type protected cable terminal—is one of the most popular items in the Automatic-Sands line. It has a capacity of 11 to 26 pairs and comes regularly equipped with Type 2105 Discharge Blocks.

While all of the products in the Automatic - Sands line represent considerable technical advance over previous protective equipment, with respect to improved mechanical construction and increased durability, interest is centered largely in the Type 2105 discharge block, which is standard equipment on all substation protectors and protected cable terminals. The discharge block is the key to effective protection against lightning and power currents. The Type 2105 block is an air gap type, self-cleaning and self-restoring. Having carbon to carbon discharge surfaces, there is no metal to burn away and render the block unsafe or inoperative. Its

(Turn to Page 6, Col. 3)

Graphs Show Performance of New Transmitter

Scientific tests conducted by Automatic Electric engineers have demonstrated conclusively that the use of ring-shaped electrodes and spherical insulated carbon chamber result in greater volume and higher fidelity throughout the "all-positions" cycle. Automatic Electric engineers have released a series of curves illustrating graphically the results of these tests.

A careful examination of the graphs will show the principal advantages of Type 35A7 design and construction, as revealed and verified by the most scientifically accurate tests that laboratory experts have been able to devise. Briefly summarized, they embrace the following points: 1. Uniform response regardless of position held. 2. High fidelity with no sacrifice of volume. 3. Unaffected by humidity, temperature or pressure. 4. Longer service life without deterioration. 5. Sensitivity does not change either gradually or periodically.

This performance summary indicates true "all-positions" performance, where regardless of position in which the handset is held, the transmitter delivers uniformly high results, unaffected by humidity, temperature or pressure. To the purchaser of handset telephones, this represents an important advance in transmission characteristics.

New Transmitter Permits Talking in Comfort

When you use the Monophone hand unit, it doesn't matter what way you hold it. Just assume the most comfortable position. The new Monophone transmitter will "talk up" perfectly.

In compiling the necessary data, the transmission engineers utilized the most up-to-date laboratory equipment known to acoustic science to supplement the usual "talk and listen" tests. In this way, they were able to measure transmitter response with scientific accuracy and to plot curves showing the various characteristics of the transmitter's performance.

These curves have been enlarged and mounted on transparent glass slides, which form part of the interesting transmitter display at the convention exhibit of Automatic Electric Company.

"Monotype" Jumper Wire Years Ahead, Tests Show

The new "Monotype" Jumper Wire recently placed on the market by Automatic Electric Company is years ahead in its method of construction and high insulation resistance, according to technicians who have subjected it to exhaustive tests.

The secret of this jumper wire's superior quality lies not only in an improved type of insulating material but also in the perfection of an exclusive and patented process of applying it. Automatic Electric Company's research engineers arranged a series of tests by means of which the insulation resistance of this wire could be ascertained under any and all conditions to which it might be subjected.

Under conditions of excessive humidity, as well as under normal conditions, it was found to have a much higher insulation resistance than wires of other makes using a similar material for insulation. Its insulation resistance after being immersed in water, then dried out (generally referred to as "insulation recovery") was found to be practically 100 per cent.

This wire has an unusually small overall diameter, holds the true color of its insulation over a long period of time and its construction gives complete and thorough protection from corrosion. It is available in single conductor, twisted pair and triplex No. 22 gauge, with either tinned or tinned-enameled copper conductors.

Protection Apparatus . . . .

(Continued from Page 5)

principal features are its ability to maintain a safe air gap for a much longer life, and its capacity to automatically ground the line under severe conditions, and to remove the ground when those conditions have passed.

Other pieces of Automatic-Sands protective equipment bear the same stamp of ingenious design and painstaking manufacture. For adequate protection "all along the line" there is no better name than Automatic-Sands.

McAvoy Named By Central Carolina

W. G. McAvoy, former manager, Iowa State Telephone Co. exchange at Albia, Ia., has been promoted to general manager of the Central Carolina Telephone Co. and Coastal Telephone Co. at Southern Pines, N. C., it has been announced.

The companies of which he is to be manager are owned by the Investors Telephone Co.

In North Carolina he will succeed R. S. DuRant, who has been transferred to Newton, Ia., as vice-president of the Investors Telephone Co. and vice-president in charge of operations of the Iowa State Telephone Co.

Mr. DuRant succeeds H. R. Christianson who resigned his position with the Iowa State company to accept a similar post with the Associated Telephone Co. at Muskegon, Mich.

Lester Larson of Shelby, Ia., has returned to Albia, his former home, to become manager of the Iowa State Telephone Co. Albia exchange suceeding W. G. McAvoy.

Deaf Sets Installed on Public Telephones

Public telephones with amplifying equipment to aid persons who are partially deaf in making telephone calls are the latest service provided for telephone users in Chicago. These telephones are installed in the public pay station locations at the Palmer House, Stevens Hotel and Chicago and North Western Passenger Terminal.

This amplifying equipment has been available for installation in homes and places of business for some time, but it is only recently that it has been made available to the hard of hearing who use public telephones. Many of the customers for this service have amplifiers on their home and office telephones but are unable to use other telephones.

China-Jap 'Phone Link

Radio telephone service was inaugurated recently between Japan and China. The service at the Japanese end extends to all the important centers, including Tokyo, Osaka and Kobe. In China it is, for the present, restricted to Shanghai.

Building New Line

At a meeting of the stockholders of Blacksburg-Newport (Va.) Telephone Co. last month it was decided to build a new telephone line. Work has already been started on the line under the supervision of a competent foreman, and long distance service by Blacksburg will be available soon.

Long dependable life is built into the Manchester positive plate of the Exide Chloride Battery.

Dependability

is a "built-in" quality characteristic of every Exide Chloride Battery

In modern telephone service Exide Batteries assure absolute dependability. They deliver power when needed most—*in emergencies.* Furthermore, their operation in common service is not affected by interruptions or fluctuations in the A.C. circuits. There is an Exide Battery for every telephone job whether it is common service, emergency reserve, signalling or P. B. X. Whenever dependability, long life and freedom from care are the determining factors for selecting a telephone battery, Exides are invariably chosen.

Exide

BATTERIES

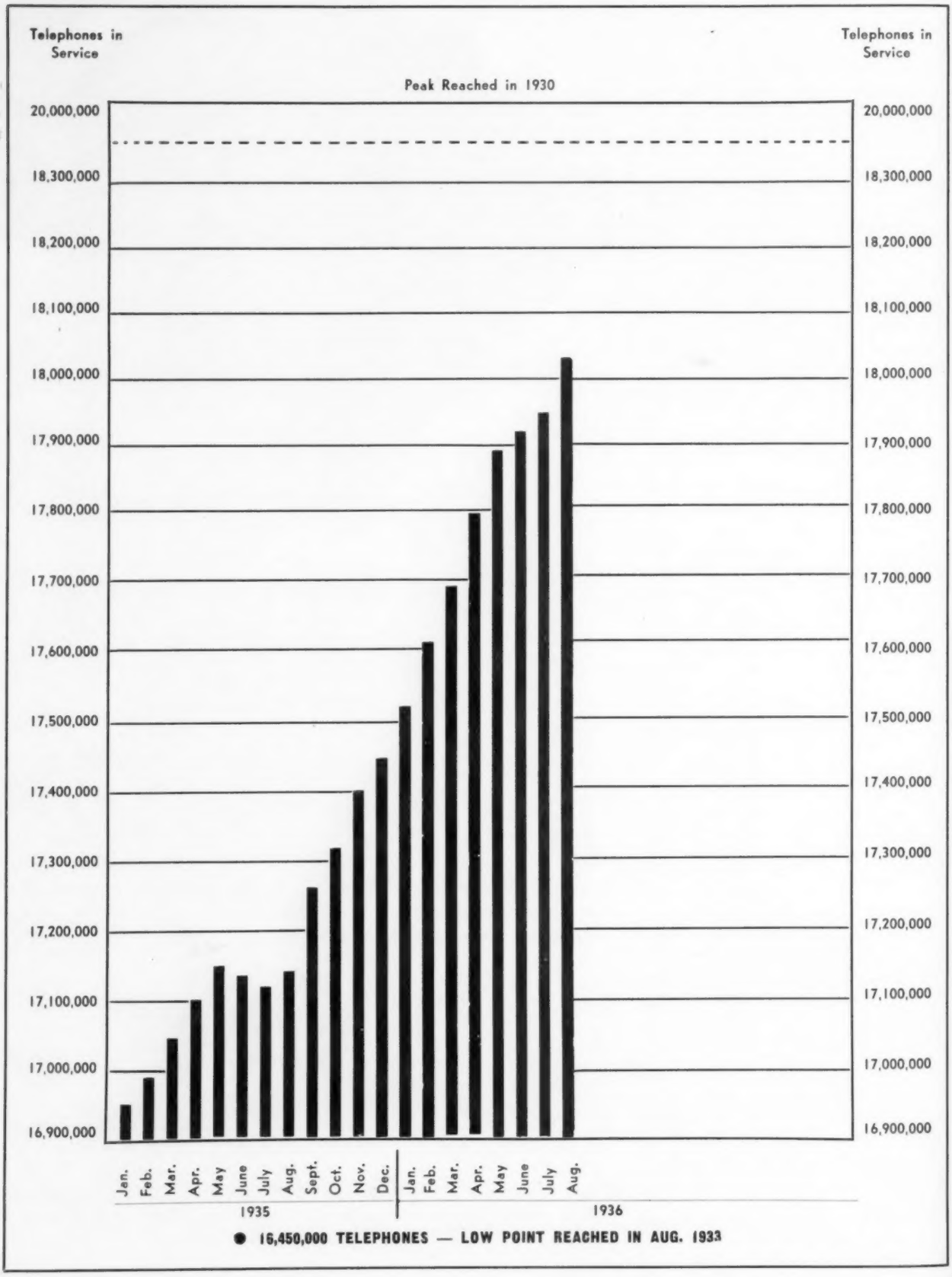
FOR EVERY TELEPHONE USE

THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia

The World's Largest Manufacturers of Storage Batteries for Every Purpose

Exide Batteries of Canada, Limited, Toronto

Monthly Telephone Station Barometer



Dependable Service *with*

LEICH
Equipment

No. 90 C.B. Self Contained Handset Telephone
with Straight Line or Harmonic Ringer.

TELEPHONES
(Common Battery, Magneto)

- **Beautiful**
- **Modern**
- **Efficient**
- **Stay in Service**
  No time out for repairs
- **Approved by the Public**

LEICH TELEPHONE EQUIPMENT is engineered to meet the needs of modern telephone service.

New materials, new designs and careful workmanship assure you of satisfactory service from LEICH apparatus. Every piece of equipment which we sell has our unqualified guarantee of good service.

If you have not used LEICH EQUIPMENT in your exchange you are missing the opportunity of getting the lowest maintenance cost. Ask the man who uses LEICH TELEPHONES for his experience.

• WIRE
IRON, COPPER
BRONZE, INTERIOR

• RELAYS
TELEPHONE SIGNAL
SIGNAL
SPECIAL APPLICATIONS

• SWITCHBOARDS
COMMON BATTERY
MAGNETO

• CONVERTERS
HARMONIC
RINGING

Also a Complete Line of Telephone Construction Hardware

LEICH ELECTRIC COMPANY
GENOA, ILL.

TELEPHONE APPARATUS BACKED BY 30 YEARS' SERVICE

. . . at the
CONVENTION
2541
HOTEL STEVENS CHICAGO

See:
FIRE
BURGLAR
HOLD-UP
"ALARMS"
by
Guardian
. . . Ask "Doc"

to explain how you can INCREASE your service to the public — and your yearly REVENUE at practically NO EXPENSE!

Room 2541 Stevens Hotel

GUARDIAN
ELECTRIC MANUFACTUR'G CO.
1621-27 W. Walnut Street.
CHICAGO · ILLINOIS

To Dance For Pioneers

The Bytonettes, international dance favorites, will be one of the many features on the program of the Independent Pioneers' "An Evening at a Night Club" the night of October 15 at Stevens Hotel, Chicago.

Newspaper Criticizes Telephone Investigation

Editorial from the Milwaukee Journal

"Without any regard to personalities or who shall conduct the federal communications commission's inquiry into the telephone business, it may be said that a change in the policy of the investigation is needed.

"Mr. Becker and Mr. Bickley, it is understood, are to continue as chief counsel and chief accountant. But they would be better advised to get away from the headlines somewhat and down to more prosaic facts.

"There has been too much made of the fact that the A. T. and T. did some lobbying (What monopoly does not?), that it tried to influence public opinion (They all try it), and that is gave service to a racing news organization service.

"There has not been enough attention given to the vast corporate structure of this organization, how it operates through its subsidiaries, the manufacturing and engineering aspects of the business, and the methods used for determining rates.

"It may be all very well as a 'stunt' to get Walter S. Gifford, the American Telephone and Telegraph Co.'s $206,000 a year head, on the stand, but you do not get in this way facts that you can use. Mr. Gifford's appearance was a fencing exhibition between him and Mr. Becker. But it did not help the people much to understand the telephone business. It contributed about as much as did somebody's stunt, in another investigation, of pushing a dwarf into J. P. Morgan's lap and then taking a picture of the two.

The A. T. and T. is a $5,000,000,000 business, furnishing one of America's most important communication services. It is intricately organized to produce this service. Vast financing, manufacturing, engineering, construction, rate calculations, are involved.

"What should be done is to take the A. T. and T. apart and see how it is made. If it is all right, well and good. If it is not all right, then the commission investigation should show that fact.

"What the people are interested in is just this—Are they paying too much for telephone service? Are the profits larger than they should be in the case of a monopoly that involves little risk? Or if they are not too large now, could the rates be reduced by wiser planning, care against over-building and better management?

"If Mr. Becker and Mr. Bickley have been harassed because they have stepped on somebody's toes, we have no sympathy with that. We do not care how many toes they step on if they get the necessary facts. But they have not, to date, conducted the most highly constructive investigation.

Company Changes Hands

The Whittlesey (Wis.) Telephone Co., has been bought by the Midway Telephone Co. of Medford, Wis.

The new management will replace the present system with a dial system and the work of changing to the other system has been going on for some time.

Rough Going

. . . that shows what stuff Western Electric Cable is made of!

Rugged country like this puts telephone cable to the test—and Western Electric cable comes through with colors flying. You can always count on it for years of satisfactory service.

Among the standard types of Western Electric cables are: lead covered—impregnated jute protected—tape armored—wire armored submarine—textile insulated and cellulose acetate lacquered terminating cables. Special cables to meet your specific needs will be made on order.

Telephone companies all over the country are giving their customers better service by replacing open wire with Western Electric cable—made to Bell System standards of quality. For full information, write Graybar Electric, Graybar Building, New York—or call Graybar's nearest branch.

Western Electric

LEAD COVERED CABLE AND TELEPHONE APPARATUS

Distributed by GRAYBAR *Electric Company*

Prevention
IS BETTER THAN
CURE

Adequate protection represents a very small percentage of the cost of any cable installation.

Cook S-6 not only provides a perfect means of terminating and distributing cable, but adequate protection with a minimum maintenance.

The S-6 terminal is provided with Cook True Gap Dischargers that shunt to ground high potentials without permanently grounding the line.

Service on protective devices equipped with Cook True Gap Dischargers is reduced to an annual inspection.

COOK ELECTRIC COMPANY CHICAGO

Telephone Transmission Theory and Practice

(Continued from page 23)

values which may be expected in practice.

TABLE 12
Line Current Under Various Key Conditions In a Typical Polar Duplex Circuit

Key Condition	Line Current	Home Station Battery Current	Home Station Meter Reading
Home Key Closed Distant Key Closed	0	40	—40R
Home Key Open Distant Key Closed	80	110	—40R
Home Key Closed Distant Key Open	80	110	+40L
Home Key Open Distant Key Open	0	40	+40L

Referring to Fig. 43, two duplex circuits may be connected together as follows: The local repeat switch is thrown to the repeat position and a reversed cord (tip to sleeve and sleeve to tip) used to patch the two sets together. If the sounders are to be used, the cord may be inserted in jack No. 3, otherwise the cord may be connected in jack No. 1 of either set. A single line Morse circuit may be connected to a duplex terminal set by means of a half set using the same type cord connected between the jack of the half set and either jack No. 1 or No. 3 of the duplex set.

As the duplex set employs current reversals for operation of the relay, the speed is limited only by the characteristics of the line and relays. Relays are available which will operate satisfactorily up to frequencies of 60 cycles. However, other factors such as noise and induction, make impractical operating speeds over about 30 cycles per second. This is a rather general statement and is based more or less on past experience. In the future we may obtain operation at higher speeds; however, on circuits over which both telephone and telegraph communication is furnished, the limit of 30 cycles appears to be about as high as may be expected.

A system for obtaining two simultaneous telegraph circuits in each direction over one wire is known as the **quadruplex.** It has been used extensively in the past but of late has been more or less discarded. One circuit is derived in the same manner as the differential duplex previously described. The second circuit is obtained by varying the current in the line which operates a "neutral relay". The relays in the past have required a current variation of about 3 to 1 for satisfactory operation, the range generally being about 20 ma. on the low (space signal) side and 60 ma. on the high (marking signal) side. The circuit functions quite well in dry weather but gives considerable trouble when the insulation is low due to lack of margin between the marking and spacing signals. The neutral relay must inherently be somewhat sluggish and therefore can not be operated at very high speeds. This limits the use of the second telegraph circuit to hand Morse operation.

It might be possible to develop a more efficient neutral relay and so improve the operation of the second or so-called common circuit. So far as I know, no attempt has been made in recent years to apply the principles of modern relay design to this problem and some experimental work might result in considerable improvement. However, there are inherent limitations to the quadruplex circuit such as high battery potential and critical adjustments of both polar and neutral relays. Owing to the comparatively high operating currents required, difficulty is experienced in preventing **cross fire** (telegraph induction) into adjacent telegraph circuits. On simplexed or composited telephone circuits such high current values generally cause telegraph interference into the telephone circuit.

CORRECTION: Chapter VII—The captions including figure numbers under Figures 37 and 38 in the August issue should be interchanged.

(TO BE CONTINUED)

J. G. Ihmsen, Pioneer Telephone Leader, Dies

As this issue goes to press, we learn of the death of Jay George Ihmsen, vice-president and general manager of the New York State Telephone Association. Mr. Ihmsen passed away at his home in Albany, N. Y., Saturday, September 26. Interment was at Pittsburgh, Pa.

The death of Mr. Ihmsen was a shock to his host of friends and associates in the telephone business and with his passing the telephone industry suffers another great loss in the thin-

ning ranks of the figures who made its history.

J. G. Ihmsen

Mr. Ihmsen became associated with the telephone business in 1895 and immediately became a leading figure in the development of the Independent movement. He went aggressively into the Independent manufacturing field and did his share in seeing that the early Independent operating companies had reliable sources of supply for equipment. For 41 years Mr. Ihmsen kept constantly at the job of looking after the interests of the Independent field.

Jay George Ihmsen began his telephone experience in 1895 as secretary of the Keystone Telephone Mfg. Co., of Pittsburgh, of which Burt G. Hubbell was president. Shortly after the turn of the century the Keystone company was purchased by the American Electric Telephone Co. of Chicago and Mr. Ihmsen went with the latter as general manager.

Later, he was made general manager of the Stromberg-Carlson Telephone Mfg. Co., of Rochester. A short time later he became assistant to the president of the Federal Telephone and Telegraph Co. of Buffalo and was made its general manager.

Mr. Ihmsen left the Federal company and went with the Upstate Telephone Association of New York (now the New York State Telephone Association) as vice-president and general manager, which position he held until his death.

Many of the foremost figures in the Independent business today were close associates of Mr. Ihmsen and they, with the rest of the industry, lament the passing of this pioneer telephone leader.

MASTERGRIP ANCHORS *Save....*

Installation Time and Costs by Meeting FOUR VITAL Requirements

1 • POWER TO HOLD

MASTERGRIP Anchors are designed to offer strength, efficiency and simplicity. Tests prove their strength; design makes their simplicity; and use marks their efficiency. Try MASTERGRIP Anchors and be convinced of all three.

2 • EASY TO INSTALL

MASTERGRIP is installed quickly, at any angle, in any type of soil or under water. Drive to the required depth (larger sizes use a 3" hole), then a pull expands the blades into undisturbed soil, giving the greatest possible holding power.

3 • LIGHT IN WEIGHT

MASTERGRIP ranges in weight from 2 to 12½ lbs., yet it safely holds strains of 2000 to 30000 lbs. Since 85% of the surface area of MASTERGRIP holds against undisturbed soil, a minimum of metal is required to hold maximum strains.

4 • LOW IN COST

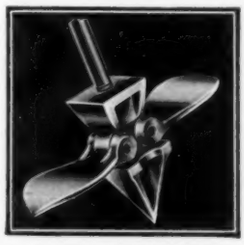
MASTERGRIP Anchors cost less because their great holding power, efficiency, easy installation and light weight make them the economical anchors to use. You get more strain per anchor dollar when you use MASTERGRIP Anchors.

MASTERGRIP THREE-WAY

MASTERGRIP H5 small three-way, weight 3½ lbs., is designed for quick installation, handling strains of 7000 to 11000 lbs. Drive the anchor down a 3" pilot hole, put on the strain. The entire operation takes only a few minutes.

MASTERGRIP G4 medium three-way will handle strains from 8000 to 13000 lbs. This efficient anchor weighs only 6¼ lbs. and is driven down a 3" pilot hole. Undisturbed soil meets 85% of the anchor surface. This means high efficiency.

MASTERGRIP F2 large three-way is designed for heavy strains. In sand 12000 lbs.; 19000 lbs. in ordinary soils and 24,000 lbs. in firm soils. This anchor weighs only 10 lbs. A 4" pilot hole is used to put the F2 to any desired depth.



MASTERGRIP TWO-WAY

MASTERGRIP O5 small two-way is driven into place and will take strains ranging from 2000 to 6000 lbs. O5 weighs 2¼ lbs. Rod size ½" to ¾". Just two moving parts.

MASTERGRIP M4 medium two-way also drives into place. Holds strains from 4000 to 8000 lbs. M4 weighs only 3¼ lbs. Rod size ½" to ¾".

MASTERGRIP L2 large two-way handles strains from 9000 to 20000 lbs. and weighs 5¾ lbs. It is driven down a 3" pilot hole. Rod sizes from ⅝" to 1". Simple assembly.

• MASTERGRIP KABLE KING •

Ideal for rural lines and light strains.

MASTERGRIP KABLE KING, rodless drive anchor, is designed for use with a cable. Simply attach the cable, set a ¾" tube on the anchor head and drive into place. Tests show satisfactory strains of 2000 lbs. in sandy, 4000 lbs. in ordinary and 6000 lbs. in firm soils. Kable King weighs only 2¼ lbs. You will be pleased with its easy installation and excellent results.

WRITE YOUR JOBBER OR

THE AIKEN
MASTERGRIP
ANCHOR CO., INC.

114 N. Seventh St., St. Louis — 63 E. Lake St., Chicago

Williamsport STRAND

has a uniform coating of the most solid, toughest and most ductile zinc structure possible to obtain and will withstand any wrap, bend or test equal to or better than any other galvanized product available.

Let us send you a special booklet on the way Williamsport Strand is processed.

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122 S. Michigan Ave., Chicago, Ill.
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Other Offices in All Principal Cities

Switchboard Maintenance; By C. K. Brown

(Continued from page 25)

● A schematic circuit drawing is shown in Fig. 7, in which values have been assigned to the various portions to enable a solution to be obtained by the formula

$$I\,b = \frac{E_1 r_2 + E_2 r_1}{r_1 r_2 + r_2 R + r_1 R}$$ Where

E_1=E. M. F. or P. B. X. battery.
E_2=E. M. F. of Central Office battery.
r_1=resistance of wiring at P. B. X. battery.
r_2=resistance of cable conductors from Central office to P. B. X.
R =72 ohms resistance (equivalent resistance of P. B. X. circuits plus telephone station loops.)
Ib=Current in P. B. X. circuits connections.

Then by substituting for letters in the formula we have:

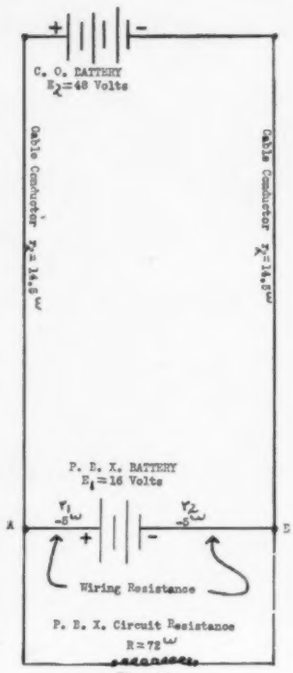

Fig. 7

$$Ib = \frac{(16 \times 14.5 + 14.5) + (48 \times .5 + .5)}{(.5 + .5 \times 14.5 + 14.5) + (.5 + .5 \times 72) + (14.5 + 14.5 \times 72)} = 0.221 \text{ amperes.}$$

In starting the solution of this problem the electric current "Ib" was assumed to be in a specific direction, the E. M. F. "E_2" was assumed to be of a size which will cause the current to flow in the direction assumed. If one of the batteries, say "E_2" had been reversed, the current "Ib" in "R" would have been obtained by putting minus (–) "E_2" for plus (+) "E_2" and the formula would read:

$$Ib = \frac{E_1 r_2 - E_2 r_1}{r_1 r_2 + r_2 R + r_1 R}$$

The minus sign indicates that the current is actually flowing in the opposite direction, that is, reversed from that assumed.

In order to find the value of the true voltage of the E. M. F. "A B" (Fig. 7) the following method may be used. First: when two batteries are so connected that their E. M. F.'s are in opposition, the amount of the respective voltages should be subtracted and the difference used as the active voltage of the circuit. Therefore, 48 – 16=32 volts. Second:

$$I = \frac{E}{R + \left(\frac{R_1 R_2}{R_1 + R_2}\right)} \text{ or } \frac{32}{29 + \left(\frac{.1 \times 72}{.1 + 72}\right)} = \frac{32}{29.099} = 1.2 \text{ amperes.}$$

Third: To find the E. M. F. "A" to "B" by Ohm's Law; E=IR, where "I" equals 1.2, "R" equals .099 then E=1.2 × .099 = 0.119 volts. Then 16 volts across "A" to "B" plus 0.119 volts will be the true value of the voltage "A B" or 16.119 volts.

New System for Ohio Town

Another step favorable to the future progress of Bowling Green, O., will occur next winter or early spring when the city's entire telephone system undergoes a complete change to provide a better, more efficient service for local and rural residents.

A project to make the city's communication system automatic, which when completed, will have cost in excess of $150,000, has been announced by the Northern Ohio Telephone Co.

As rapidly as possible, every telephone in the city and rural area served by the company is now being changed so dials can easily be placed on them. All phones installed during the gradual business increase of the company are of the new type.

A major portion of outside equipment installed during the five-year period includes new cables, poles, and wires.

Ten years ago the average speed of service on a transcontinental telephone call between New York and San Francisco was 20 minutes. Today it is less than two minutes.

IDEAL FOR BUSINESS OR HOME... Stromberg-Carlson 1191 Handset

Modern as the day itself, the Stromberg-Carlson 1191 Handset is an ideal instrument for home or office use. Its graceful design, the creation of one of America's outstanding artists, harmonizes with the most select surroundings.

Being self-contained, with ringer, induction coil and condenser mounted in the base of the instrument, it does away with the necessity of a bell box with its consequent defacement of walls.

This feature is also important from the operating company's standpoint, as substantial economies are effected by having but one instrument to install and service instead of two.

Both transmitter and receiver are of an advanced design, permitting a clarity of articulation undreamed of previously.

Perfectly balanced, the instrument can be held during long conversations without fatigue on the part of the user.

Order a Stromberg-Carlson 1191 Handset . . . test it under your most rigid requirements—then you will see why it's the choice of operating companies and subscribers alike.

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FACTORY AND GENERAL OFFICES: 100 CARLSON ROAD, ROCHESTER, N. Y., U. S. A.
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MAKERS OF VOICE TRANSMISSION AND VOICE RECEPTION APPARATUS FOR MORE THAN FORTY YEARS

A DEPENDABLE

CABLE TERMINAL

Reliable RU unprotected terminals are easy to install, easy to work on and built to outlast the cable.

Write for a sample

Reliable Electric Company

Chicago, Ill.

Harry Bates Thayer, Former A. T. & T. President, Dies

Harry Bates Thayer, former president and chairman of the board of directors of the American Telephone & Telegraph Co., died at his home in New Canaan, Conn., on September 3. He was 78 years old. Almost all of his business life was spent with the Bell System and within a few years his career coincided with the life and development of the telephone up to the time of his retirement in 1928.

He was with the Western Electric Co. from 1881 and was president of the company from 1908 to 1919, when he became president of the American Telephone & Telegraph Co. He became chairman of the board of directors of A.T. & T. in 1925 and served in this capacity until his retirement in 1928.

Mr. Thayer was born at Northfield, Vt., August 17, 1858. He was graduated from Dartmouth College in 1879. His first position was that of a railway clerk for the Central Vermont Railroad Co. in Bellows Falls, Vt. Later he became a clerk in a Northfield Savings Bank.

He entered the service of the Western Electric Co. in Chicago in January, 1881, as a shipping clerk at a salary of $10 a week. At that time the company was doing an annual business of about three-quarters of a million dollars. He became president of the Western Electric Co. in 1908. When he left the company's annual business had grown to about $150,000,000.

From the beginning his activities in the Western Electric Co. pertained largely to the operating side of the telephone business, which even at that time was beginning to assume very great importance. After three years of faithful work in the telephone field of the Western Electric Co., in Chicago and the west, Mr. Thayer was transferred to New York as manager of the Western Electric Co. in that city.

The performance of his new duties brought him into the closest relations with the telephone officials of this country, and from that time dated his most intimate participation in all of the larger problems which engaged the attention of the telephone companies of the United States.

On February 19, 1902, Mr. Thayer was elected vice-president of the Western Electric Co. and on March 3, 1908, he was elected its president. In February, 1909, he was elected one of the vice-presidents of the American Telephone & Telegraph Co., but continued as president of the Western Electric Co. until 1919.

During his connection with the Bell System the investment, which was about 25 million dollars at the time he went to work in the manufacturing division, increased to more than 3½ billions.

During the World War, Mr. Thayer was one of the government's "Dollar-a-year men," being appointed a member of the aircraft board by President Wilson.

Increases Service Hours; Granted Increase in Rates

The South Carolina public service commission has approved an increase in the rates of subscribers of the Due West Telephone Co. which will enable the company to furnish 24 hour service seven days each week.

The company has formerly furnished 14 hour service six days a week, with two hours on Sunday. The increase approved was 25 cents per month for all subscribers using company - owned lines.

The change was authorized as the result of a hearing on the application conducted in Due West by B. H. Barre, chief engineer. No opposition was presented at the hearing.

Cleveland Retires From Illinois Bell Service

U. F. Cleveland, vice-president in charge of finance and accounts for the Illinois Bell Telephone Co., resigned from that position September 1, because of reaching retirement age.

Mr. Cleveland has been with the Illinois Bell and its predecessor, the Chicago Telephone Co., for almost 45 years. In 1892 he entered the secretary's office as a pay roll clerk. Since then he has been engaged entirely in accounting work.

In 1910 he was made traveling auditor for the company. He became special accountant in 1915, and general auditor in 1920. He was elected vice-president in 1930.

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. . . the Messenger to Replace or Respace . . . when NATIONAL CABLE RINGS are used!

. . . for the "tension grip" built into every National Ring assures its staying rigidly in position, once placed. And don't forget "Nationals" are easy to place and with their use the cable can be pulled either way.

Nationals are fastened in the clever new "Handy Five" clusters which assure ease of handling, no hooking together and no ground litter. Write for information today.

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Canadian Mfr.—N. Slater Ltd., Hamilton, Ont.
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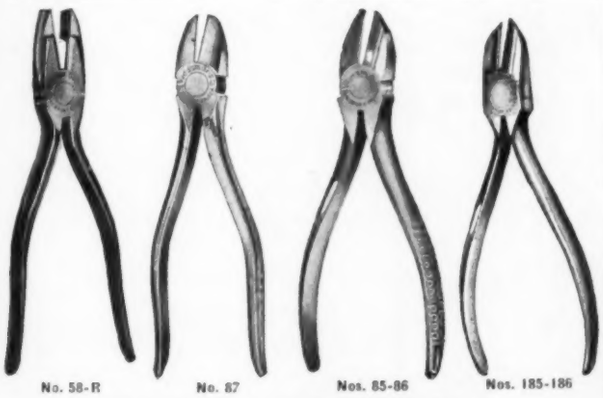

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No. 195-196

Outlasting ordinary makes three and four to one, these famous "Quality" Pliers represent a saving that stands out conspicuously on your tool budget sheet.
LINEMAN PLIERS—Improved pattern; tapered nose; insulation stripper; No. 58-R—8½". No. 57-R—7". No. 56-R—6"
HEAVY DUTY DIAGONALS—Most powerful cutters of their size. No. 87—fashioned handles—7". No. 86—6". No. 85—5".
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SLEEVE CONNECTOR—No. 12—All size wires.
Write for Complete Catalog and Prices. Ask about our 30-Day Trial Plan.

FORGED STEEL PRODUCTS CO.
Newport, Pa.

Vacuum Grip Pliers

BUILT UP TO A STANDARD
SET DOWN TO A PRICE

OVER A MILLION IN USE

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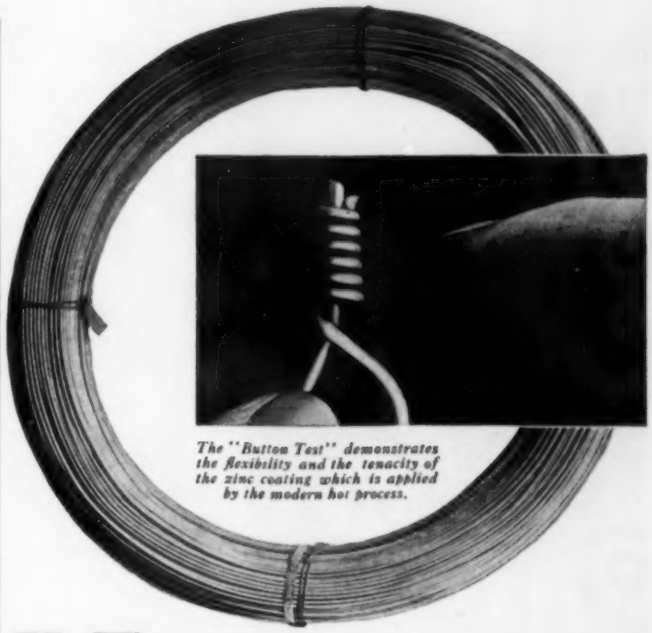

The "Button Test" demonstrates the flexibility and the tenacity of the zinc coating which is applied by the modern hot process.

HOT *Galvanized* to assure Longer Life

U·S·S Perfected Telephone, Telegraph Wires and Strand are galvanized by the hot process. By this tried and tested method, the properly treated wire is passed through a molten bath of pure, high grade zinc. Both metals are chemically bonded — and form as strong a combination as when hydrogen is combined with oxygen to form water.

When the wire leaves the bath, it assures an even and uniform coating that fully satisfies every service and laboratory requirement for ductility, strength and corrosion resistance. The coating will not flake, crack or disintegrate under the hardest of service conditions.

Because of these facts millions of miles of USS Perfected Telephone, Telegraph Wires and Strand have been placed in service —and coil after coil is specified today with every confidence of longer life and a full measure of value.

USS Perfected Steel Strand is so constructed that it can be cut at any point without seizing. In construction work this fact saves much time.

U·S·S PERFECTED
Telephone, Telegraph Wire & Strand

AMERICAN STEEL & WIRE COMPANY

208 S. LaSalle St., Chicago Empire State Bldg., New York

Columbia Steel Company, San Francisco, *Pacific Coast Distributors*
United States Steel Products Company, New York, *Export Distributors*

UNITED STATES STEEL

More Hours of Service

. . . that's what every telephone engineer seeks . . . *more hours of service* . . . which means fewer replacements, lower service costs! And that's exactly what Ray-O-Vac telephone batteries offer!

For 3 decades Ray-O-Vac batteries have met and exceeded specifications and requirements on every recognized telephone and light intermittent test, and surpass all government standards. For lower service costs, specify Ray-O-Vac!

RAY-O-VAC COMPANY
Formerly FRENCH BATTERY COMPANY
MAIN OFFICES AND PLANT
MADISON, WISCONSIN
Additional Factories at Clinton, Massachusetts and Lancaster, Ohio

"Tapping In" On Washington"

(Continued from page 18)

cluding the Durham (N. C.) Telephone Co., York (Pa.) Telephone Co., Texas Telephone Co., Missouri Telephone Co., Citizens Telephone Co. of Terre Haute, Ind., and Kittanning (Pa.) Telephone Co. The other carriers in this situation are receiving similar notices.

A further example of the FCC's lack of desire to place Independents under its jurisdiction was indicated in a decision placing eleven small Minnesota companies in the Pioneer Telephone Co. group in the category of connecting carriers. The Northwestern Bell Telephone Co. had an investment in the group's preferred stock, but the FCC decided these companies were not under so-called "Bell control" without any hearings.

With approval of the recommendations of Chief Examiner Arnold that four other Independent companies in which there was a substantial Bell stock interest were not under Bell control, the commission on September 11 completed the list of hearings so far held on that issue. The four companies classified as connecting carriers through the ratification of the examiner's findings were the DeKalb-Ogle Telephone Co. of Sycamore, Ill., the Mansfield and Chillicothe Telephone companies, both of Ohio, and the Citizens' Telephone Co. of Clay County, Ind. This now makes a total of eight "Bell interest" companies classified as connecting carriers and five—the Rochester (N. Y.) Telephone Corp., the Champaign Telephone Co. of Urbana, O., the Cass County (Mo.) Telephone Co. and the Milton and Milton Junction Telephone Co. and the Northwest Telephone Co. of Tomah, Wis. — held under Bell control, according to the examiner's recommendations which are still awaiting commission action. In the case of the two Wisconsin companies, the Wisconsin Public Service Commission is opposing the finding that these carriers are under Bell control and should be under FCC jurisdiction. The Rochester Telephone Corp. is going to make an appeal for a reversal of the examiner's recommendation in an oral argument before the telephone division September 28. Another Independent company in New York state, the Jamestown Telephone Co., has also been brought before the FCC examiner to defend itself against alleged stock control by the New York (Bell) Telephone Co.

"Hay-wire" Telephone System Dismantled

One of the oddest modern telephone "systems" in America will pass out of its present independent existence within a few weeks. It is the "hay-wire" system connecting certain Saskatchewan and Montana farms, constructed of odds and ends of wire, parts of radio sets and general "junk," according to its builders, says the New London Day. Officially it was known as the Treelon-Patrio system, and it served 41 farmers and ranchers in isolated districts near the border. Built in 1934 by its ingenious subscribers, it had no outside link with the world of telephone wires, but operated for its members only. The farmers banded together to gather the material needed, drove more than 100 miles to get the trees for the poles to carry the wires, and installed and built everything necessary themselves. Gus Richter, a rancher, is chief mechanic and traffic director. He confesses that it has sometimes seemed a marvel to him that the system worked, for he used everything from radio loud speakers to baled hay wire to construct it.

Now the system is about to be linked with the Saskatchewan Province Telephone Co's. lines.

Australia Speaks

Due to its distance from other centers of civilization, some unusual telephone calls have been made during the past year from Australia. One of these was a call of 19,000 miles from Sydney to Valparaiso, via London and Buenos Aires, with perfect reception.

W. M. Bashlin, Inc.
Linemen's Equipment
Safety — Comfort
Quality
Safety Straps
Climbers
Belts
etc.
Don't miss our display at the National Convention
ROOM 2563
Stevens Hotel, Chicago
W. M. Bashlin, Inc.
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The MASTER Ringing Machine

Be sure to see it at the Chicago Convention

Nothing to Wear Out!

- No Moving Parts
- No Adjustments
- Economical
- No Radio Interference
- Produces a Powerful Ringing Current
- Operates on 110 volts A.C.

Price $45.00

30 DAYS FREE TRIAL

You Take No Risk

SUB-CYCLE

LORAIN PRODUCTS CORPORATION,
Lorain, Ohio.

Lorain Products Corporation is exclusive manufacturer for use and sale in United States. Address foreign inquiries to Automatic Electric Sales Co., Ltd., Chicago, Ill.

Sold By Leading Distributors

CHANCE ANCHORS

No. 84-1

Approximately 65% of total area in undisturbed earth.

MEET EVERY REQUIREMENT

A type and size for every job . . .

- Steel Expanding
- Malleable Expanding
- Never-Creep Plate
- Screw Anchors
- Cone Anchors
- Rock Anchors

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CENTRALIA MISSOURI

WORLD'S LARGEST ANCHOR MANUFACTURERS

FOR THE TELEPHONE INDUSTRY

PUL-LIFT

The 'PIGMY' HOIST with a GIANT'S POWER

It operates either in vertical or horizontal position, and can be carried about easily by one man. This remarkable little hoist is truly "the tool of 1,000 uses." Its pulling and lifting power is amazing—it is made in four sizes, ¾, 1½, 3 and 6-ton capacities.

Sold by Yale Distributors

THE YALE & TOWNE MFG. CO.
PHILADELPHIA DIVISION • PHILADELPHIA, PA.

BUILT TO "TAKE IT"

THE YEAR 'ROUND

IN HOT WEATHER OR ICY COLD

OWENS-ILLINOIS

HEMINGRAY

Pin-Type Glass **INSULATORS** *are OK for long life*

● There's no proving ground for insulators like actual service right up on the poles where nature can hammer away at them winter and summer with cold, heat, rain, frost, wind and snow. That's where Hemingray Insulators have proved they are unaffected by seasonal or sudden temperature changes. They are homogeneous in character with only one coefficient of expansion. Write us about your requirements. Owens-Illinois Glass Company, Structural Materials Division, Muncie, Ind.

OWENS-ILLINOIS Glass PRODUCTS

BETTER PLIERS

● Klein Pliers are made for the man who needs or appreciates a remarkably fine tool.

From the careful inspection of the alloy tool steel made to the most exacting specifications—

Through the old craftsman methods of individual manufacturing and individual heat treating—

To the final steps of rigid inspection and testing, each pair of pliers that carries the Klein trademark represents the maximum in plier quality.

Klein methods viewed in the light of modern mass production are necessarily more costly.

On the other hand, for a man who demands a plier of Klein quality there is no way to produce it except the Klein way.

Mathias KLEIN & Sons

3200 BELMONT AVENUE, CHICAGO, ILL.

Line and Desk: Questions and Answers

(Continued from page 26)

starting to clean the terminal. This water will not harm the terminal in any way.

Q. Would you consider creosoted log anchors suitable for use on new cable construction?

A. Log anchors can of course be used and will hold the strain though their installation is always expensive. Good patent anchors can now be purchased at a reasonable cost and everything considered we believe them more desirable.

Q. How should a waterproof concrete manhole be constructed?

A. The construction of an absolute water proof manhole is almost impossible. However, the greater part of the water may be kept out by constructing concrete manholes of one part cement, two parts sand and four parts rock. All ducts must of course be properly sealed.

Q. Is the copper-oxide type rectifier now considered satisfactory for use in charging telephone batteries?

A. I know of one exchange of 430 subscribers lines that has used a 12-ampere size copper-oxide rectifier since 1934 with complete success. Thousands of the one-ampere size are giving perfect service in telephone exchanges throughout the world. The copper-oxide type telephone battery charger is now available in one-ampere to 20-ampere sizes and have been proved entirely satisfactory.

Q. Is it considered a satisfactory practice to splice one or two-pair rubber insulated lead covered lateral cables into main paper insulated cables?

A. While this can and has been done in a few cases it has not proved satisfactory and is not recommended. The lateral cables should always be connected at a cable terminal. A special waterproof cable terminal is available for installation in manholes when necessary. With this tvpe terminal the lateral cable entrances are made through stuffing boxes.

Western Electric Dividend

At a meeting of the directors of the Western Electric Co. held this month, a dividend of 75c per share on its common stock was declared. The dividend is payable on September 30 to stockholders of record at the close of business on September 21.

BOOK REVIEW

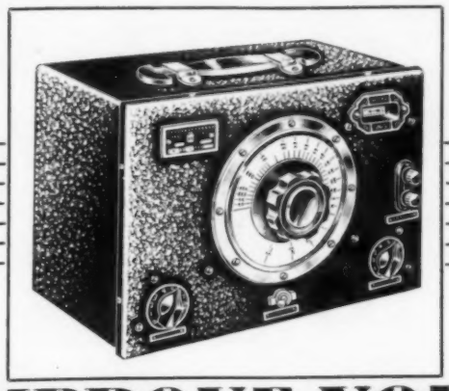
HANDBOOK ON ENGINEERING FUNDAMENTALS. O. W Eshbach, E.E., M.S., Editor-in-Chief, and 40 contributors. 1081 pages; illustrated; 6 by 9; $5.00. Order through TELEPHONE ENGINEER.

This is the first volume in the proposed new Engineering Handbook Series which represents a complete revision of the basic conception of American handbooks. Since mathematics, physics and chemistry form the basis of all engineering, these are the fields dealt with in the new volume.

The first section presents a selection of mathematical and physical tables, including new and revised tables of the Wiley American Handbook series, in which particular attention has been given to arrangement, typography and general convenience. In addition to well arranged tables on engineering constants, properties of numbers, logarithms, trigonometric and hyperbolic functions, there is included a series of tables of conversion factors for weights and measures arranged in order of dimensional sequence, tables of integrals, standard structural shapes, and physical properties of metallic and non-metallic materials.

Other sections offer such features as: the presentation of dimension systems, systems of units, standards, and introduction to the theory of dimensional analysis; the systematically arranged and clearly illustrated fundamentals of theoretical mechanics and mechanics of materials with application to beams, columns, shafts, and reinforced concrete; the modern theory of fluid mechanics as applied to the fields of hydraulics and aerodynamics; engineering thermodynamics, embodying the latest physical concepts of the fundamentals of heat engineering; the theory of the electric, magnetic and dielectric circuits and their application to generalized networks and transient theory; the fundamental principles of general chemistry, chemical tables and industrial chemistry; the principles of light, acoustics and meteorogical phenomena; an extensive handbook treatment of the properties of metallic and nonmetallic materials with reference to features of manufacture and use; and a discussion of the elementary legal aspects of contractual relations with which all engineers should be familiar.

This is a volume which every engineer, regardless of his specialty, will find a veritable treasure trove of information.



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IF YOUR FACILITIES ARE INADEQUATE
IF YOUR LONG LINES DON'T TALK UP
WE CAN HELP YOU — AT A LOW COST

We have manufactured telephone repeaters, amplifiers, loading coils and carrier systems since 1930. This equipment has been installed on more than 5000 miles of telephone lines. Our line of testing equipment is complete and includes voltmeters, ammeters, milliameters, level indicators, wheatstone bridges, impedance bridges, transmission test sets, oscilloscopes and noise meters.

COMMUNICATION EQUIPMENT & ENGINEERING COMPANY

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AS LITTLE AS $1.50 A DAY FOR A SPACIOUS ROOM ON *Michigan Avenue* IN CHICAGO

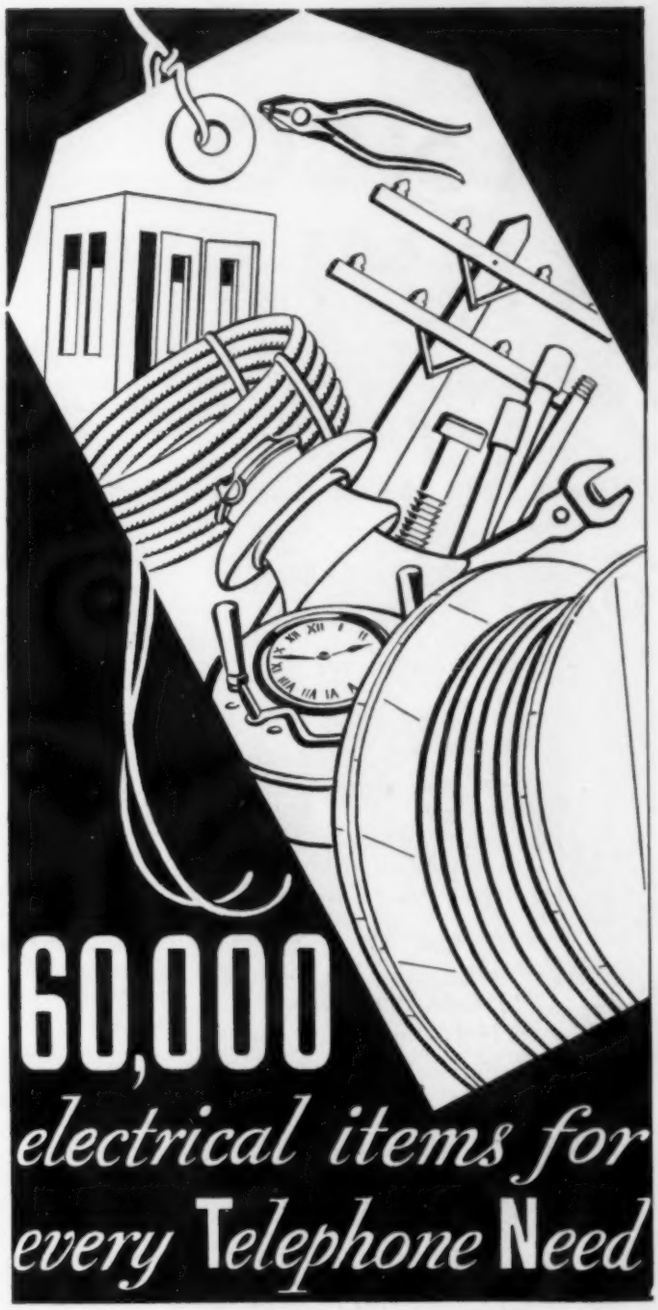
MICHIGAN AVENUE AT CONGRESS

HOTEL **AUDITORIUM**

WITH PRIVATE BATH *from* $2.50 WITHOUT BATH *from* $1.50

GEO. H. MINK *Manager*

Here's a hotel value for you. A large room right at the edge of the Loop, with every comfort and luxury at a rate surprisingly low



60,000 *electrical items for every Telephone Need*

In these days when everyone is looking for purchasing economies, Graybar's service of supplies makes economies possible . . . It brings 60,000 electrical items within arm's reach of the telephone user. Does away with "shopping" around. Eliminates expensive stocks ... The natural result of Graybar's long experience in meeting the special needs of the telephone industry—an experience that goes back to the beginnings of that industry in America. **GraybaR**

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SENCO

SURGE PROTECTOR and ARC SUPPRESSION PRODUCTS

For Telephone Lines

250 V. Heavy Duty Protector

500 V. Heavy Duty Arc Suppressor

- Lighting
- Static Electricity
- Noisy Lines
- Inductive Surges

PRINCIPLE: No current flows until the ionizing voltage of the protector tube is reached, by reason of the induced surge. The ionized gas then by-passes the transient to ground, and reduces the line potential to normal in .010 to .1125 seconds.

- Electronic Action
- Accurate Predetermined Breakdown for all Climates
- No Wearing or Corroding of Internal Parts
- Vacuum Sealed

Send today for Bulletin 1436. Presents tables, oscillograms on modern surge protection and other interesting data for which you have use.

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ENGINEERING COMPANY
(Affiliate of Littelfuse Laboratories)
4266 LINCOLN AVENUE
CHICAGO, ILLINOIS

Report A. T. & T. Will Refund 440 Million Bonds

Reports are current that the American Telephone and Telegraph Co. soon will begin refunding its own obligations, now that a program of replacing funded debt of subsidiaries with lower interest bearing securities has been largely completed.

Approximately $137,600,000 of subsidiary bonds bearing an average of about 5 per cent interest have been replaced with issues paying 3½ and 3¼ per cent during the last 18 months.

The parent company program, which may involve as much as $440,000,000, is expected to be launched with the refunding of the $117,984,700 issue of 5 per cent debentures due in 1960. It is said negotiations have reached the point where these obligations may be retired before the end of this year.

The debentures are callable at 110 on 60 days' notice prior to any interest date. To retire the issue before the Jan. 1, 1937, interest date, it would be necessary to call the debentures by Nov. 1.

Other parent company issues which may be included in the proposed refunding operation include $95,000,000 of 5½ per cent bonds due in 1943, $64,000,000 of 5 per cent collateral trust bonds of 1946, $150,000,000 of 5s of 1965, and possibly the $12,900,000 of 4½s dues in 1939.

Carrying through the plans is said to depend to a large extent on the continuance of the present easy money market and generally low interest rates.

Aside from this, however, the company's improvement in earnings has been favorable to refunding.

It is considered possible that earnings this year will cover the $9 annual dividend rate which has been maintained throughout the depression by tapping surplus to make up the difference between requirements and the smaller earnings.

In addition to refunding $137,600,000 of underlying company obligations since April, 1935, almost $60,000,000 of debt has been wiped out without refunding. Included in this amount are $35,000,000 of Western Electric Co. bonds.

Biggest August Gain

A net gain of 68,000 telephones for the Bell System in August, the largest August gain in its history, was reported by the company. The increase compared with a gain of 28,600 stations in July and 28,000 in June. In August, 1935, there was an increase of 27,000.

For the eight months ended August 31, last, the Bell System recorded a net gain of 481,300 telephones, as against an increase of 206,300 in the like period a year ago.

STURGIS

TRUE POSTURE
Operator Chairs

No. 446-DS

A true posture chair designed to increase efficiency, mental alertness, reduce fatigue, improve the health and comfort of the operator.

Write For Particulars
Available in 3 Different Heights.
Distributed by
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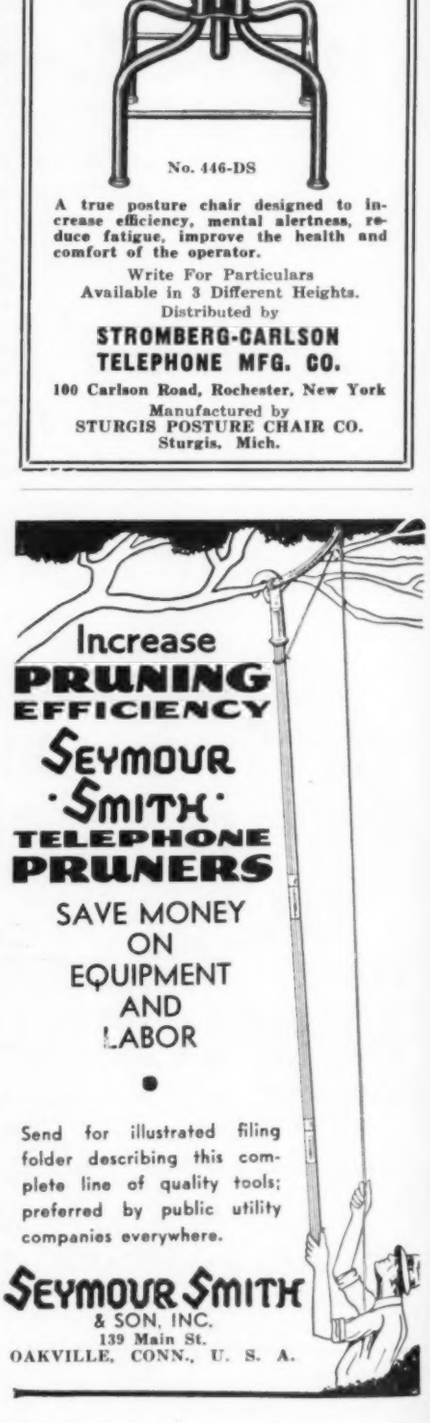

Commonwealth Co. Gets Bond Permit

The Commonwealth Telephone Co., Madison, has been authorized by the Wisconsin public service commission to issue $2,750,000 of first mortgage bonds, series A, paying 4 per cent and maturing in 1966, to refinance all its outstanding funded debt.

The bonds are to be sold at not less than 99 per cent of par value, the commission provided. Semi-annual reports of sales and use of proceeds are to be filed with the commission.

Over the period of the bonds the discount and expense incurred in connection with the refinancing shall be amortized by equal annual charges, the commission prescribed.

Part of the proceeds will be used to reimburse the company's treasury for expenditures heretofore made in retiring and cancelling bonds. The indenture securing the bonds provides that the company will retire, starting in 937, $50,000 of the bonds each year or else make expenditures for bondable property equal to $1,666.67 for each $1,000 of bonds which would otherwise be retired. The company will also pay to the trustee annually a sufficient sum to redeem bonds annually.

Bonds to be retired are $1,639,000 of Commonwealth Telephone Co. first mortgage 5 per cent gold bonds, series A, and $916,000 of Consolidated Telephone Co. of Wisconsin first mortgage 5.5 per cent sinking fund gold bonds, series A.

Long Distance Rate Reduction in Effect

The voluntary rate reduction on long-distance calls for which tariffs were filed by the American Telephone and Telegraph Co. with the Federal Communications Commission recently, became effective September 1.

"The reduction in long-distance rates, which on the basis of present business is expected to save the public $7,350,000 annually, is another step in a definite program for better and cheaper long-distance telephone service which we have been working on for years," Walter S. Gifford, president, said, commenting on the new rates.

The reduction is the seventh voluntary adjustment downward in ten years, effecting a total annual saving of $25,000,000.

A large market concern in Washington, D. C., has found that it has more than doubled its business since advertising its telephone number. This firm now places its telephone numbers on all advertising matter, including calendars, packages and boxes.

Compression Tested

In addition to the "Bomb Test," samples of all Whitney Blake Telephone Wire are tested in a machine especially designed for checking the strength and density of rubber compound of Telephone Wire. The long life of Whitney Blake Telephone Wire is partly due to the use of this unique machine, which indicates the ability of the insulation to withstand the stresses and strains it will be subjected to during and after installation.

Telephone Wire

WB

RUBBER COVERED
COPPERWELD - BRONZE - COPPER
DROP - INSIDE and BRIDLE

MANUFACTURED BY
The Whitney Blake Co.
SOLE SELLING AGENTS IN U. S. A.

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ELECTRIC COMPANY

FOREIGN DISTRIBUTORS: *International Standard Electric Corporation*, 67 Broad St., N. Y. C.

"UNIQUE"
Cable Splicer's Tools That Satisfy

FOLDING WIND-SHIELDS
COOL BALANCED LADLES
FORMED WIPING CLOTHS
SOLDER COPPER HANDLES
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Gasoline—Kerosene
Designed for the telephone industry. Sent on trial. Catalogue?
UNIQUE Mfg. Co., Inc.
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DAVEY LINE CLEARING SERVICE

Why Davey Service?

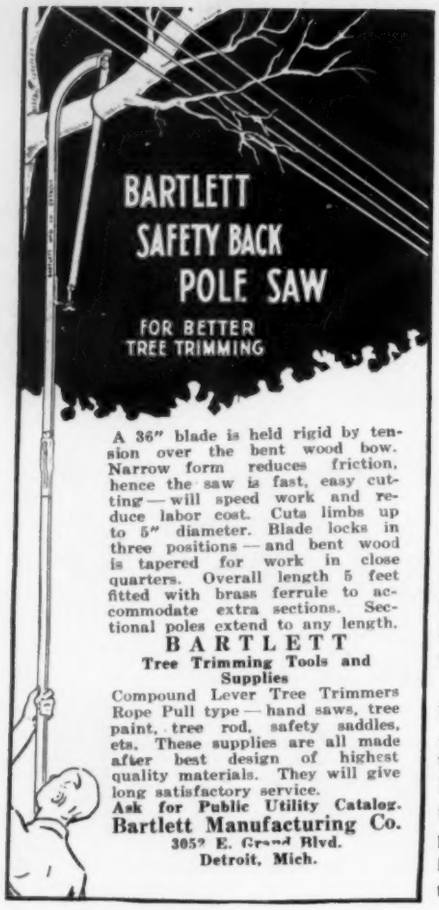
Shrewd-buying telephone companies here, there and everywhere, are turning to Davey line clearing service because among other things the cost is right. They like it because it is:

- Economical
- Quickly Available
- Effective
- Liked by Tree Owners

You will like Davey men. They are alert, industrious, painstakingly selected. All are completely trained in the handling of tree problems. They are specially trained to do efficient, skillful line clearing work. A Davey representative can tell you more.

THE DAVEY TREE EXPERT CO.
Kent, Ohio

DAVEY
TREE SURGEONS



A 36" blade is held rigid by tension over the bent wood bow. Narrow form reduces friction, hence the saw is fast, easy cutting — will speed work and reduce labor cost. Cuts limbs up to 5" diameter. Blade locks in three positions — and bent wood is tapered for work in close quarters. Overall length 5 feet fitted with brass ferrule to accommodate extra sections. Sectional poles extend to any length.

BARTLETT
Tree Trimming Tools and Supplies

Compound Lever Tree Trimmers Rope Pull type — hand saws, tree paint, tree rod, safety saddles, ets. These supplies are all made after best design of highest quality materials. They will give long satisfactory service.

Ask for Public Utility Catalog.
Bartlett Manufacturing Co.
3059 E. Grand Blvd.
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W. L. Runzel, President, brings to this organization 47 years' experience in the manufacture of this type of telephone equipment.

Telephone and Switchboard Cords and Wire

May we quote you on your requirements?

RUNZEL CORD and WIRE CO.

4727-31 Montrose Ave., Chicago
The Home of the Perfect Cord

William G. Bickelhaupt Passes Away

William G. Bickelhaupt, formerly president of the Dakota Central Telephone Co., Aberdeen, S. D., passed away in Del Mar, Calif., on August 21. A Masonic service in San Diego, Calif., was held and interment was in Aberdeen following services there, which were attended by employees of the Dakota Central Telephone Co. as a group.

Mr. Bickelhaupt was prominent in the Independent telephone field for many years. He served as a director of the United States Independent Telephone Association for several terms.

When the Western Dakota Telephone Co. was organized in 1898 by the late J. L. W. Zietlow, Mr. Bickelhaupt became a director of the company, and lines were constructed between Aberdeen, Leola and Eureka. Two years later he, with other Aberdeen business men, went to Everett, Wash., where they organized a flour mill.

He resumed his association with the telephone company when he returned to Aberdeen in 1903. He became secretary-treasurer, as well as a director, when the Dakota Central company was formed the following year. At that time the company served Ortonville, Redfield and Doland, and Mr. Bickehaupt was active in the management. He became president of the company upon the death of J. L. W. Zietlow in 1922, holding that position until 1930, when he retired.

New Manager at Albany, Ill.

Gerald Hill, formerly of Fulton, Ill., has assumed the duties of manager of the Albany, (Ill.) telephone company following the resignation of Floyd Wilson.

The United States leads the world in the number of telephones in relation to population, according to latest available figures. 13.36 telephones per 100 persons.

Johns-Manville President On N. Y. Telephone Board

Lewis H. Brown, president of Johns-Manville Corp., was appointed a director of the New York Telephone Co. at a meeting of the company's board this month.

Mr. Brown is also a director of Johns-Manville, chairman of the boards of the Johns-Manville International Corp. and other related companies and president of the Canadian Johns-Manville Corp. In May of this year he was made a trustee of the Mutual Life Insurance Co. of New York.

New Combination Electric Drill and Hammer

A new type of electric tool that is being announced to the telephone industry is the Wodack "Do-All" made by the Wodack Electric Tool Corp., 4627 W. Huron St., Chicago. It combines an electric hammer for drilling in concrete, brick and stone, with an electric drill for metal or wood. The change

New Electric Drill

from hammer to drill is made by loosening a cap screw and opening the chuck, which can be done in one minute, according to the company. Another use for this versatile tool is as a portable or bench grinder and buffer. The tool is made in two models, one with a drilling capacity of 1⅛" in concrete and 5/16" in metal, and the other 1⅜" in concrete and ⅜" in metal. Accessories include star drills, chisels, bull points, carrying case, bench grinding stand, grinding, buffing and scratch wheels, and drill stand.

ADVANCED DESIGN HOISTS

Reading from left to right the hoists are: Model A or F, ¾ ton or 1½ tons; Model AT or FT, 1½ tons or 3 tons; Model Z 4½, 4½ tons; Model Z, 6 tons.

Telephone linemen find the Model A ¾ ton Coffing Hoist, weight 14 lbs., invaluable for stretching guy wires, messengers, underground cables, etc.

COFFING hoists and tools are standard equipment with 85% of the Telephone Industry. Write, today, for our complete catalog.

COFFING HOIST CO.
DANVILLE -:- ILLINOIS

James E. Finley of Ohio Passes Away

James E. Finley, Ohio sales representative of the Stromberg-Carlson Telephone Mfg. Co., died at the Grant Hospital, Columbus, Ohio, on September 3 following an operation for appendicitis. He was 49 years old.

James E. Finley

Mr. Finley's association with the telephone field dated back to 1905 when he was employed by the Stromberg-Carlson company and sent to Syracuse, N. Y., to install equipment in the Inpendent exchange there.

After two years with Stromberg-Carlson he went to Chicago to become associated with the Chicago Telephone Co.

In 1909 Mr. Finley went to the New York Telephone Co. and for the following nine years was engaged in central office inspection and testing work with that company and the Western Electric Co.

He returned to the Stromberg-Carlson company in 1916 and, with the exception of two years with the Junction City (Kans.) Telephone Co. and the Citizens' Independent Telephone Co. at Terre Haute, Ind., he had been with this company.

He became sales representative in Ohio for Stromberg-Carlson in 1925 and in 1930 was made its senior representative in that state with headquarters in Columbus. He was a member of the Independent Pioneer Telephone Association of the United States.

There are some 16,000 telephones on the island of Tasmania. Now that these are linked by cable with the telephones on the mainland of Australia, they are also within reach of all telephones in the U. S., since radio telephone service between America and Australia has been available for some years.

Crapo GALVANIZED PRODUCTS

INDIANA STEEL & WIRE CO. Crapo Galvanized MUNCIE, IND.

Line Gangs Know from Actual Experience

MEN in the field recognize the outstanding advantages of *Crapo* Galvanized Telephone Wire and Steel Strand. They know from experience that these dependable products can be spliced without injury to the heavy, *pure* zinc galvanized coating; that they are easily and quickly served; that they last longer in actual service under all conditions. For long life and low maintenance costs, specify genuine *Crapo* Galvanized Wire and Strand on all new and replacement jobs! Their superiority in actual service is a matter of record in the engineering offices of some of America's leading public service companies.

Indiana Steel & Wire Company
Muncie, Indiana

Telephone and Telegraph Wire

• • •

Steel Strand

See the

"Tablephone"

at the National Convention

A new kind of Magneto Telephone

Illustrated and described in "Suttle Salesman" Catalog No. 41

"It pays to read Suttle Catalogs"

Suttle Equipment Co.

LAWRENCEVILLE, ILLINOIS

ONE INSTRUMENT FOR ALL TESTS
The Shallcross No. 614 Telephone Service Meter

Measures:
6 to 300 Volts A.C. or D.C.

D.C. Current 15 M.A. to 6 Amperes

Resistance .5 to 50,000 ohms

Inductance, Capacity and Continuity

Incorporates a standard dry cell test and power level indicator. The instrument was developed by telephone men for the exchange man and trouble shooters. Will not become obsolete. Covers the fundamental tests; accurate, dependable and moderately priced.

Send for Bulletin 614-ND

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For the convenience of readers of Telephone Engineer

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ACCOUNTING

HERDRICH AND BOGGS
Certified Public Accountants
Specializing in Telephone Accounting and Rate Cases Since 1918.
803 ELECTRIC BUILDING
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Your Bookkeeper

Should be one who has had the practical experience of Operating, Owning and Managing Telephone Plants. He should be a specialist in Telephone Accounting. He should be able to make up the books in his office from data supplied by you, and at a nominal cost. He should supply the necessary reporting Forms without charge, and be ready to assist you with your various annual Government or State reports. Twenty-five years of this kind of experience is offered to you.

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22 years continuous contact with telephone organizations.

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Interurban Building
COLUMBUS, OHIO

Lightning Arresters

L. S. BRACH Mfg. Corp., Newark, N. J.

NEON ARRESTER UNIT
Replaces Carbon Mica
Avoid Grounds or Leaks

SOLDERALL
Pure Metal Solder and Flux Combined
In Collapsible Tube

TEST-O-LITE
Pocket Voltage Tester—100 to 500 Volts
Indicates AC or DC and Polarity

WRITE FOR BRACH CATALOGUE

CONSISTENT CONSECUTIVE
Advertising on This Page is Economical
Write for Rates!

Phillips Adds To Plant To Meet Increased Business

Telephone officials throughout Canada will be interested to know of the extensive additional facilities which are planned for the plant of the Phillips Electrical Works, Ltd., Brockville, Ontario, to take care of the increased telephone business which this company has enjoyed during the last year. Two new buildings will be erected at an early date: one a new manufacturing unit approximately 90 feet x 150 feet in size, where the activities of the recently added telephone manufacturing division of the organization will be centered; the other an office building approximately 50 feet x 100 feet in size, necessitated by the continued growth in the company's general wire, cable and copper products business. The total cost of these buildings will be close to $200,000 and it is expected that they will both be ready for occupancy by November 1.

Officials of the Phillips company state that these additional manufacturing facilities will expedite deliveries of telephone instruments and equipment and place the company in a better position than ever to serve telephone organizations throughout the Dominion.

C-A Wood Preserver Issues Booklet

The C-A Wood Preserver Co., St. Louis has issued an interesting pocket size booklet "Stop That Rot" which describes the company's recommended process for protecting wood from rot, termites and other vermin. C-A Wood Preserver is said to be 100 per cent high boiling anthracene oil, a coal tar derivative found in smaller percentage also in high grade creosote.

The booklet interestingly describes how rot and decay take place in untreated woods and shows various methods of treating woods by brushing, spraying or pressure treatment methods, together with examples of treated wood structures which have endured for exceptional periods under severe weathering.

Copies of this booklet may be had by writing the C-A Wood Preserver Co.

Poles

Carney
CEDAR POLES
Plain or Butt Treated
B. J. CARNEY & CO.
100 No. 7th St. Minneapolis

VC
Finished Cedar Poles
VALENTINE CLARK CORPORATION
St. Paul, Minn.

Telephone Directories

Telephone Directory
ADVERTISING
Write or telephone for proposition
L.M.BERRY & CO.
Call L.D.16 - Telephone Bldg., Dayton, O.

Telephone Engineers

J. G. WRAY & CO.
Telephone Engineers
Specialists in Appraisals, Rate Surveys, Financial Investigations, Organization and Operation of Telephone Companies
105 West Adams Street
CHICAGO

J. W. WOPAT
CONSULTING ENGINEER
Telephone Engineering — Construction Supervision — Appraisals — Financial — Rate Investigations
303 East Berry Street
Fort Wayne, Indiana

JOHN C. LARKIN AND COMPANY
CONSULTING
ACCOUNTANTS AND ENGINEERS
Specializing in a Professional Service to Telephone Utilities Covering the Field of Accounting and Engineering
Chamber of Commerce Building
SYRACUSE, NEW YORK

The Clearing House

For the convenience of readers of Telephone Engineer

Telephone Equipment

Convention Notice

For the duration of the Independent Telephone Convention

We will occupy *Room No. 2538* on the Exhibition Floor of the Stevens Hotel. We will show samples of our *repair work* and *rebuilt telephones.*

All telephone men and their friends are welcome.

Telephone Repair Shop

1760 LUNT AVE., CHICAGO, ILLINOIS

DANIEL H. McNULTY, Owner & Manager

RECONSTRUCTED EQUIPMENT

1 Western Elec. No. 1801 40 line capacity Common battery P. B. X. board equipped with 30 local lamp lines, 5 cord Ckts., 2 trunks with dial, Hand Gen., etc., all mounted on 3 drawer flat top desk @ $125.00

Western Elec. No. 20AL Desk set with Trans. & Rec. Complete with No. 334 Straight line steel signal set @ 8.25

Western Elec. No. 533 Straight line C. B. Steel hotel set with enclosed Gongs @ 7.75

1 Western Elec. No. 62A Ringing machine operates off from 6 to 8 volts Storage battery, delivers 20 cycle 80 Volts A. C. ringing current @ 10.00

Kellogg No. 729 S. A. Common battery Oak finish Wood hotel sets with Booster Coil @ 6.75

Monarch desk set with Trans. Rec. & Cord complete with 3-bar 1000 or 1600 ohm ringer inside connection signal set $7.85; 4-bar @ 8.75

Leich Elec. Local Battery Transmitters complete with Mouthpiece & back @ .85

Automatic Elec. Slip type Receivers with New Western Elec. Shell & Cord @ 1.05

Leich Elec. Slip Type Receivers with New shell & Cord @ 1.15

Western Elec. No. 122 External post connection Rec. without cord @ ..... .65

Western Elec. No. 21D or E 2 MF Condensers @ ..... .35

REBUILT ELECTRIC EQUIPMENT Co. Not Inc.
1940 West 21st St., Pilsen Sta.
Chicago, Ill.

Announce Line of Gaseous Discharge Tubes

A new line of gaseous discharge tubes has been developed by the Sundt Engineering Co., Chicago, affiliate of Littelfuse Laboratories, for surge protection and arc suppression in highly inductive circuits, especially direct current.

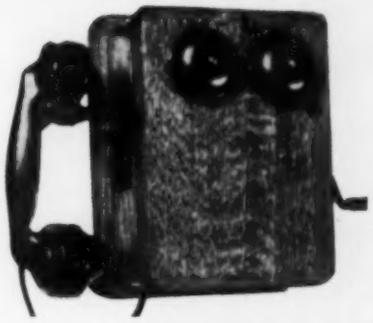
The principle of operation is that in a gaseous discharge tube no current flows until the voltage applied is sufficient to ionize the gas, it then becomes a good conductor, it is said. The tubes are rated for use in 125, 250 and 500 volt D.C. circuits and calibrated so that no load is placed upon the normal circuit. When the surge potential, due to the opening of a switch for instance, rises above normal, the tube ionizes and shunts out the surge. The tubes are ordinarily placed in shunt with the coil or magnet between the switch and coil and reduce the coil potential to normal within .010 to .1125 seconds after the circuit is opened. The very high instantaneous current carrying capacity of a discharge tube is also utilized. The projectors are offered in two current carrying capacities; the Junior line with a peak load value of 10 amperes and a heavy duty line with a peak value of 100 amperes.

A line of arc suppressers is also offered which is a combination of a surge protector and a condenser. Capacity is usually very helpful in arc suppression and by using the gaseous discharge tube in parallel with the coil a lower voltage rating of condenser is possible with resulting economies, the company states. These units are furnished only in the heavy duty type.

Overseas telephone service is now available from any Bell or Bell-connected telephone in the United States to all the principal countries in the world except China, Russia and New Zealand.

About 25,000 Bell telephones are connected and disconnected each working day.

On the average, nearly 900 telephone conversations take place in the United States every second.



• MAGNETO HANDSET TELEPHONES

Give your new Magneto Subscribers modernized telephones of latest design, by paying only a small portion of the cost of new telephones.

Send us the parts of your old telephones to be modernized into Desk Sets or Wall Compacts.

YOU SAVE THE DIFFERENCE. Write today asking for prices.

New Cabinets
Reconditioned Equipment
New Leich Hand Set

3 Bar	$13.50
4 Bar	14.00
5 Bar	14.25

Come in and see these instruments while attending the National Convention.

Room 2525
Stevens Hotel, Chicago

ALBERTSON ELECTRIC COMPANY

Telephone Department
3530 W. Pierce Street
Milwaukee, Wisconsin

CORDS

Bronze Tinsel Receiver Cords 15c
Bronze Tinsel Desk Stand Cords 30c
Special Sale on Switchboard Cords
Special Sale on Drop Wire.

INDEPENDENT CORD CO.
FRAMINGHAM, MASS.

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NEW STYLE STEWART CABLE TESTERS
With balanced coil. Locates shorts, crosses, grounds and wet spots; also tone circuit.

$49.00 Sent on trial.

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Ottawa, Ill.

Columbus, Ohio Stock of T. F. A.
(Telefon Fabric Automatic)

Moulded Insulation Switchboard Plugs

Saves you time and money

(Write for circular)

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COLUMBUS, OHIO

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and
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Clearing House Section
Will Be Carried in the
ANNUAL BUYERS' GUIDE
Issue of TELEPHONE ENGINEER
January, 1937

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